THE SECOND ANNUAL

European Software Engineering Process Group Conference 1997

EUROPEAN SEPG

Delegate Material

CONFERENCE

18-19th JUNE 1997

GRAND HOTEL KRASNAPOLSKY

AMSTERDAM

CONFERENCE - Wednesday 18th June

Morning	
Introduction	Wednesday Programme
C301	How Competitive is the European Software Industry? *Jaap van Scheijen*
C302	Professional Software Development in Europe - A Brief Assessment *David Talbot*
C303	Models of SPI: Getting Beyond Case Studies *Bill Curtis*
C304a	Competence in Software and Engineering - Siemens' Software Initiatives *Axel Völker & Gerd Wackerbarth*
C304b	Managing Culture Change *Ken Taylor*
C305a	Software Measurement Across a Global Enterprise *Gerry Pasternack & David Zubrow*
C305b	Ethics and the Software Process *Michael Cavanagh*
Afternoon	
C306a	Setting up SPI in a Multi-Cultural and De-Centralised Engineering Company *Winifred Menezes & Bernhard Eschermann*
C306b	Capability Maturity Model for Software, Version 2.0 *Bill Curtis*
C306c	Using SPI Principles to Improve the Value of Legacy Systems *Ashley Travis*
C307a	Experiencing Software Process Improvement at the Sharp End *Paul Hookham*
C307b	Requirements for Winning Software Teams *Bill Curtis*
C307c	Challenges and Solutions for SPI in a Small Company *Romana Vajde Horvat & Ivan Rozman*
C308a	PANEL: Approaches to Process Improvement Support *Moderator: Lieuwe de Jong*
C308b	SPICE and ISO/IEC 15504 *Steve Masters & Bob Smith*
C308c	Assessment and Optimization of System Architectures: Experiences with Industrial Applications at Siemens *Michael Gloger, Stefan Jockusch & Norbert Weber*
C309b	Understanding and Improving your Suppliers *Mick Bennett & Chris Amos*
C309c	Implementing and Enhancing a Quality Management System using TQM Principles and the CMM as a Framework *Stefan Lytwyn*

CONFERENCE - Thursday 19th June

Morning	
Introduction	Thursday Programme
C402	SEI Process 2000: Building on Strength *Steve Cross*
C403	The Improvement Engine of the Ericsson Systems Software Initiative *Jorma Mobrin & Anders Wästerlid*
C404a	Software Process Improvement Journey from Level 1 to Level 5 *John Vu*
C404b	Highlights and Report Back from The Measurement Symposium *Paul Goodman*
C405a	A Quarter Century of Software Process Improvement *Terry Snyder*
C405b	Continuous Quality Improvement in Software Development on the Basis of Measurement and Assessment *Holger Günther*
Afternoon	
C406a	Overcoming Resistance to Change to Become a True 'Learning Organisation' *Alistair Watters*
C406b	A Co-ordinated Approach to Identifying Software Development Risk in MoD Projects *Llewelyn Jones & John Hamilton*
C406c	Five Years' Experience with SPI: Lessons Learnt *Gilles des Rochettes*
C407a	From Chaos to Control *Debbie Hellmann & Alf Pilgrim*
C407b	The Complementary Aspects of Process Capability and Re-Use Capability *Sergio Bandinelli & Álvaro Sanz Monasterio*
C407c	Software Best Practice: Benefits to the Business *Alejandro Moya*

WEDNESDAY 18TH JUNE

Welcor ~ and Introduction

Hans S ...urg of the Netherlands SPIN (SPIder) will extend a welcome to the conference.

Bill Peterson, Head of the Software Process Improvement Program at the SEI, will then open the conference on behalf of the organisers: the Software Engineering Institute (SEI); the European Software Institute (ESI); and the European Software Process Improvement (ESPI) Foundation.

The conference will be co-chaired on both days by Bill Peterson and Chris Larner of Lloyds TSB Group.

Time	OPENING SPEAKERS	
09.00	**Welcome:** Hans Sassenburg, Netherlands SPIN (SPIder); Co-Chair: Bill Peterson, SEI & Chris Larner, Lloyds TSB Group	C300
09.15	**How Competitive is the European Software Industry?** Jaap J. van Scheijen, Ministry of Economic Affairs, The Netherlands	C301
09.30	**Professional Software Development in Europe - A Brief Assessment** David Talbot, European Commission	C302
09.55	**Models of SPI: Getting Beyond C... dies** Bill Curtis, TeraQuest Metrics	C303
10.30	Break	

	Keynotes - Track A	Keynotes - Track B
11.00	C304a **Competence in Software and Engineering - Sien... s' Software Initiatives** Axel Völker & Gerd Wackerbarth, Siemens AG	C304b **Managing Culture Change** Ken Taylor, Post Office IT SERVICES
11.45	C305a **Software Measurement Across a Global Enterprise** Gerry Pasternack, Citicorp & David Zubrow, SEI	C305b **Ethics and the Software Process** Michael Cavanagh, Balmoral Consulting
12.30	LUNCH	

	Track A	Track B	Track C
14.00	C306a **Setting up SPI in a Multi-Cultural and De-Centralised Engineering Company** Winifred Menezes & Bernhard Eschermann, ABB Corporate Research	C306b **Capability Maturity Model for Software, Version 2.0** Bill Peterson, SEI	C306c **Using SPI Principles to Improve the Value of Legacy Systems** Ashley Travis, Bank of America
14.45	C307a **Experiencing SPI at the Sharp End or 'Ouch!'** Paul Hookham, Lloyds TSB Group	C307b **Requirements for Winning Software Teams** Bill Curtis, TeraQuest Metrics Inc.	C307c **Challenges and Solutions for SPI in a Small Company** Romana Vajde Horvat & Ivan Rozman, University of Maribor
15.30		Break	
16.00	C308a **PANEL: Approaches to Process Improvement Support** Moderator: Lieuwe de Jong, Philips Panellists:	C308b **SPICE and ISO/IEC 15504** Steve Masters, SEI & Bob Smith, European Software Institute	C308c **Assessment and Optimization of System Architectures: Experiences with Industrial Applications at Siemens** Michael Gloger, Stefan Jockusch & Norbert Weber, Siemens AG
16.45	Fillip A.L. Halsey, Alcatel Keith Jackson, TBL Tim Kasse, ISPI	C309b **Understanding and Improving Your Suppliers** Mick Bennett & Chris Amos, British Telecom	C309c **Implementing and Enhancing a Quality Management System using TQM Principles and the CMM as a Framework** Stefan Lytwyn, PanCredit Systems
17.30		Bar and Exhibits	

How competitive is the European Software Industry?

Jaap van Scheijen
Director
Electronics, Services & IT department

Ministry of Economic Affairs

Outline of presentation

- **Position of European ICT industries**
- **Embedded software in The Netherlands**
- **Conclusions**

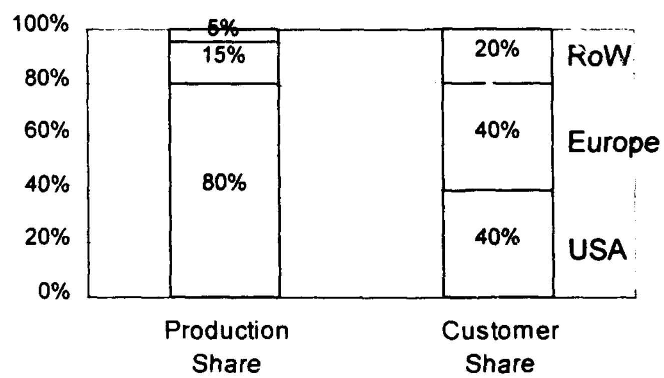
Key findings and Recommendations in Brief

Information and Communication Technology (ICT) industries are critical for the Information Society.

Europe is consistently falling behind competitors in most ICT sectors.

ICT reform has to be dramatically accelerated.

Packaged Software:
Production Share versus Customer Share



Requirements for the Application of Embedded Software

Importance and Need for improvement

Characteristic	Importance*)	Improve*)
Reliability	4.8	2.9
Quality	4.7	3.2
Standardization	4.0	3.1
Higher programming productivity	3.9	3.1
Lower sw development costs	3.9	3.2
Maintainability	3.8	2.9
Compatibility	3.5	2.9
Reusability	3.1	2.7

*) Scale of 1 to 5

Process Management Strategy

Stages of Process Management	%
No guidelines	35,2%
There are guides and standards	30,9%
Strict guides and standards	8,4%
Process is measured	5,0%
Process measured, improved	16,9%
"Don't know"	3,6%

Conclusions

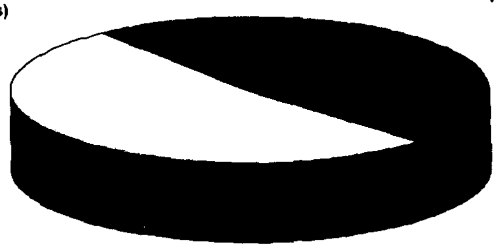
- **European software industry is competitive in embedded software and specific applications**
- **even in market-niches of packaged software**
- **special care and chances for innovative starting companies**

Professional Software Development in Europe

- The "economic dimensions"
- A (personal) view of strengths and weaknesses
- EC support for improving our capabilities

The European Commission - Software Systems and Best Practice

The "Traded" Market in Europe (1996)



Source IDC

Total Market = 72.7 becu

The European Commission - Software Systems and Best Practice

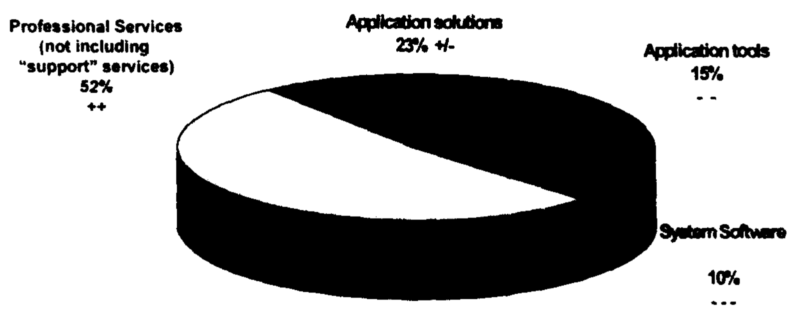
The "Hidden Market" in Europe

- Non IT ("User") Industries - producing 60-70% of all software
- "Enterprise" systems - control of costs, improve quality of service, optimise processes, reduce distance between customers and suppliers ...
- Embedded systems - (aircraft to shavers) - provide more features, increase usability, differentiate product ...

Increasingly a "core competence" in all developed sectors of the economy

The European Commission - Software Systems and Best Practice

Strengths (+) and Weaknesses (-) in The "Traded" Market



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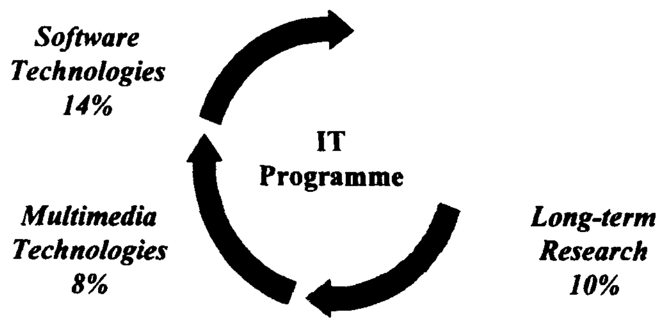
Software Capabilities in Europe

"... Recently an analysis was made of the productivity of software professionals and the quality of the resulting software by country. Six of the top ten most productive countries in the world are EU member states, and six of the top ten suppliers of software with the lowest defect levels are also EU member states ...."

Kerry Hanson, Director TI ex White House OST

The European Commission - Software Systems and Best Practice

The Fourth Framework Programme: "ESPRIT"
Underpinning Technologies and Long Term Research



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The Fourth Framework Programme: "ESPRIT" Focused Clusters

High Performance computing and Networking 13%

Integration in Manufacturing 12%

Technologies for Business Processes 9%

Open Microprocessor Systems Initiative 9%

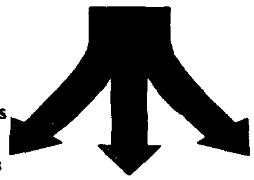
The European Commission - Software Systems and Best Practice

Software Technologies: Objectives

- To ensure that European software developers in both vendor and user organisations continue to have the skills and tools necessary to build the increasingly complex and varied systems demanded by the market
- Widen the spectrum of IT supported applications
- Make future systems more attractive and acceptable to the user

The European Commission - Software Systems and Best Practice

Current challenges



Current technologies inadequate to deal with new challenges

New R&D

Current practice makes inadequate use of available technologies

Best Practice (ESSI)

Several constraints to the deployment of leading-edge technologies

Technology Transfer

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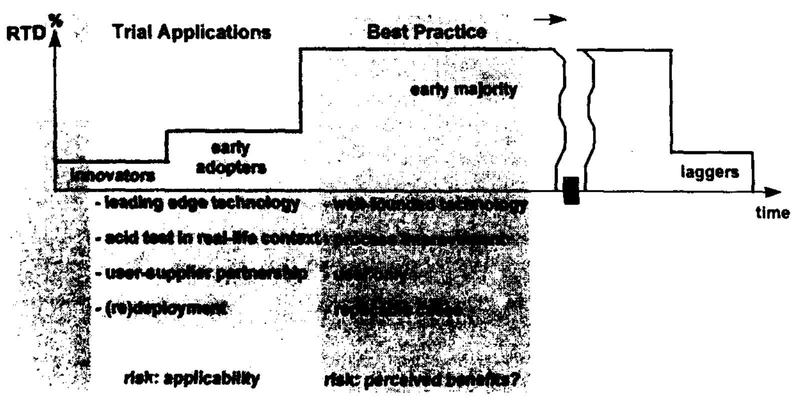
Technology Adoption Cycle



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Useful addresses

- **ESPRIT Information Desk**
  Tel. +32 2 2968596
  Fax +32 2 2968388
  http://www.cordis.lu/esprit/home.html
- **Info packages**
  http://www.cordis.lu/esprit/src/info97.htm
- **Software Technologies**
  http://www.cordis.lu/esprit/src/sthome.htm

The European Commission - Software Systems and Best Practice

AMSTERDAM

European SEPG - June 18, 1997

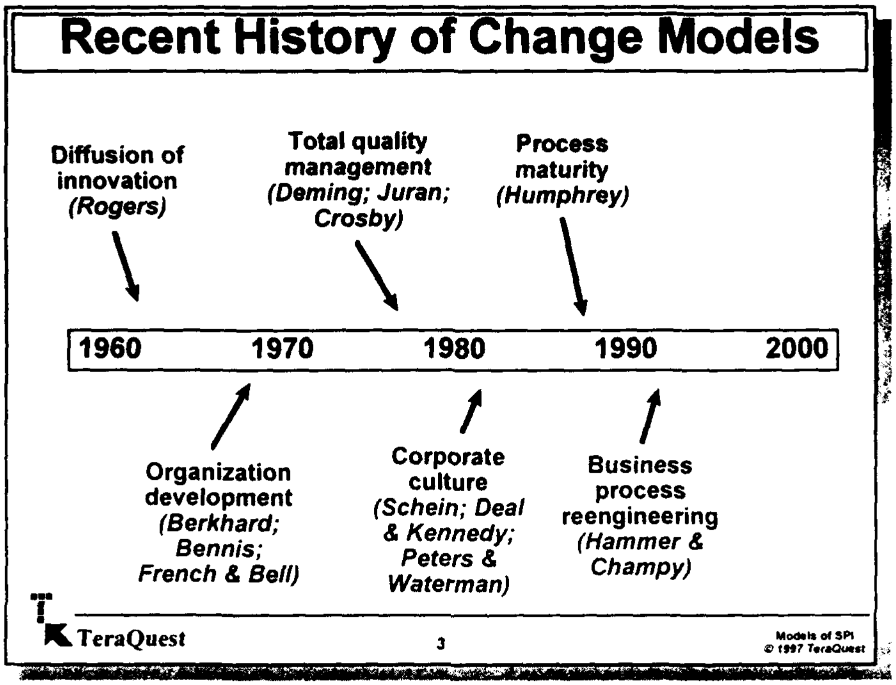
Models of SPI: Getting Beyond Case Studies

Bill Curtis
TeraQuest Metrics
Austin, Texas
&
Software Engineering Institute
Carnegie Mellon University

This talk can be accessed at http://www.teraquest.com

Dialogue at SEPG Conferences

1989 - 1996	1997 - ?	? - ?
Local learning	Community learning	Scientific learning
Case studies	Change models	Model capability
ROI reports	IDEAL	Empirical studies
2	3	4



Alternate Approaches for SPI

Top-down	**vs.**	**Bottom-up**
Technology focus	**vs.**	**Process focus**
Organizational change	**vs.**	**Process change**
Organization focus	**vs.**	**Project focus**

TeraQuest 4 Models of SPI © 1997 TeraQuest

Issues in Designing SPI Programs

Top-down vs. Bottom-up
who drives the change process?

Technology focus vs. Process focus
where is the leverage for improved results?

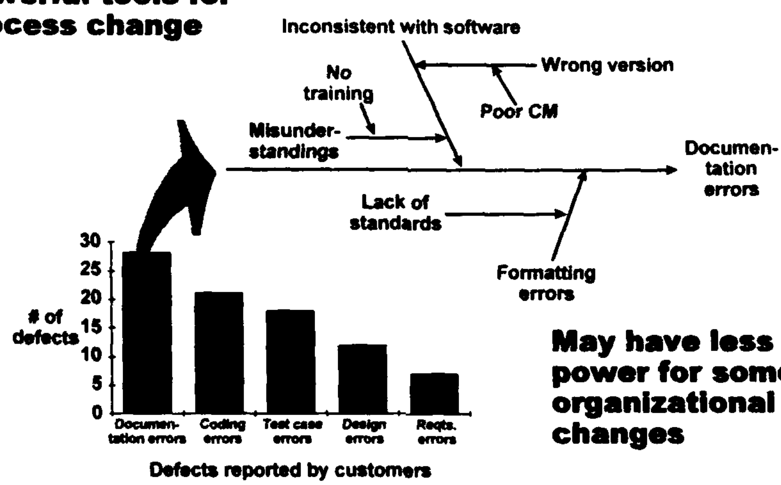
Organizational change vs. Process cha
how much supporting infrastructure is needed?

Organization focus vs. Project focus
global vs. local problem solving?

TeraQuest 5 Models of SPI © 1997 TeraQuest

Seven TQM Tools

Powerful tools for process change



May have less power for some organizational changes

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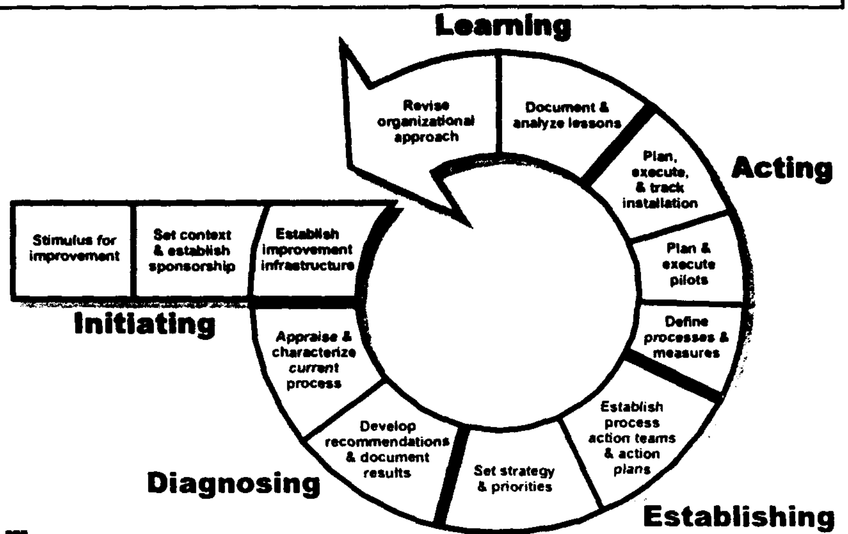
SEI's IDEAL Model



TeraQuest 7 Models of SPI © 1997 TeraQuest

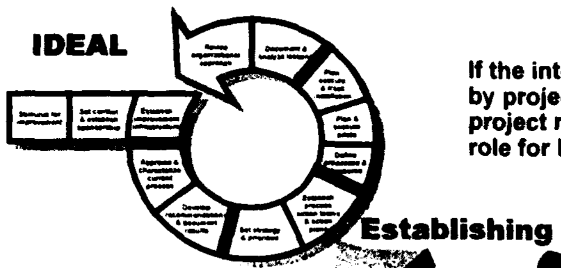
Organizational Development

- Focuses on culture and processes
- Collaboration between leaders and members
- Teams are intervention targets
- Emphasizes human and social side of organizations
- Create participatory culture
- Change a complex social system
- Consultants are facilitators and co-learners
- Develop sustainable problem-solving capability
- Action research with client participation
- Win-win solutions

French & Bell (1995). *Organization Development (5th ed.)*. Englewood Cliffs, NJ: Prentice-Hall.

TeraQuest 8 Models of SPI © 1997 TeraQuest

What Is the Role of OD in SPI?



If the intervention is a project by project implementation of project management, is there a role for Process Action Teams?

TeraQuest 9 Models of SPI © 1997 TeraQuest

'Establishing Phase' Alternatives

Alternatives for implementing level 2 practices:

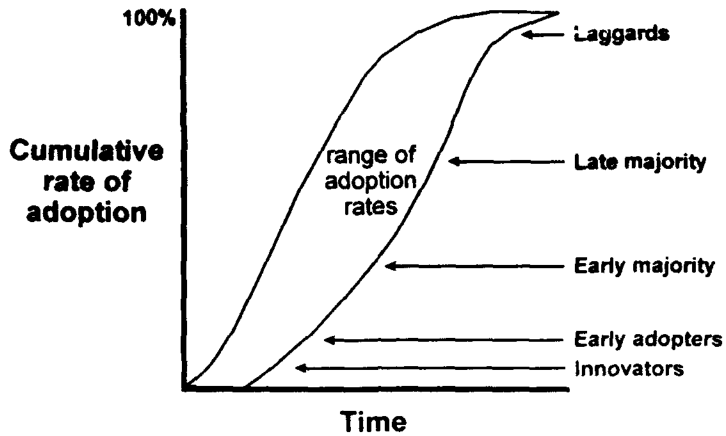
- process actions teams
- management action teams
- project action teams

Issues:

- is management actively leading or benignly supporting?
- who knows and uses the process being improved?
- are projects at different states of readiness?
- do projects vary widely in their maturity or problems?
- who has adequate responsibility and authority?

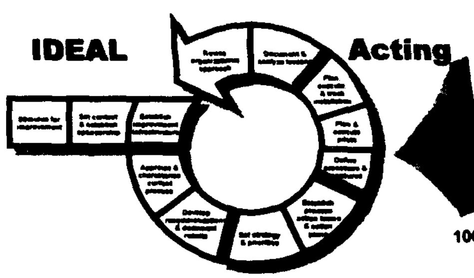
TeraQuest 10 Models of SPI © 1997 TeraQuest

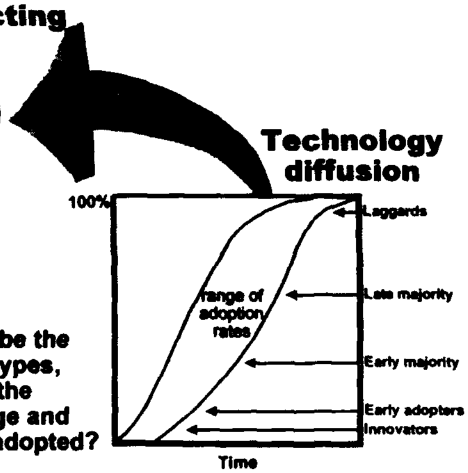
Technology Diffusion



Rogers, E. (1983). *Diffusion of Innovations (3rd ed.)*. New York: Free Press.

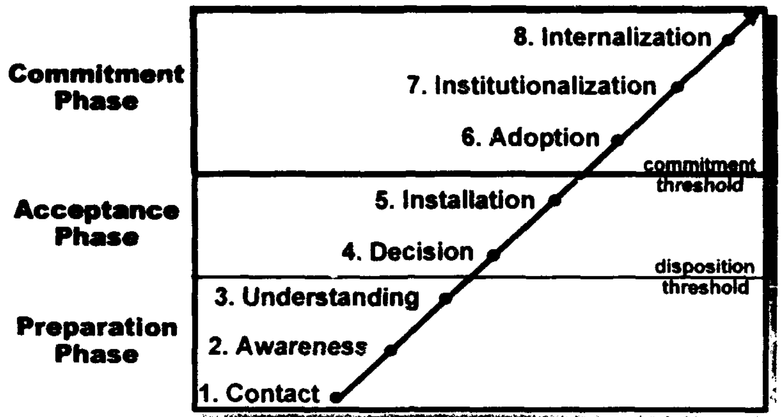
Intervention or Behavior?





Does this curve describe the effects of personality types, or the match between the project's life cycle stage and the technology being adopted?

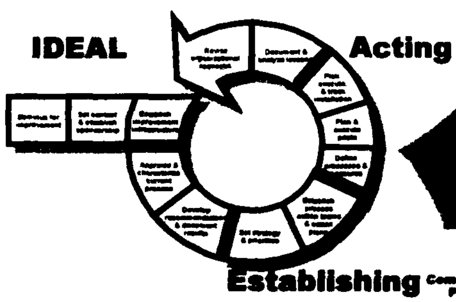
Stages of Change Commitment

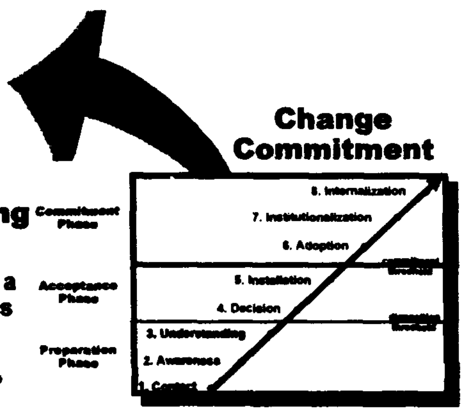


Conner, D. R. (1995). *Managing at the Speed of Change.* New York: Villard.

TeraQuest 13 Models of SPI © 1997 TeraQuest

Integrating Change Models





Are the change commitment phases an alternative to IDEAL, a description of change processes within an IDEAL cycle, or an implementation of Technology Change Management at level 5?

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Organizational Change - 'Big 3' Model

Level of change	Focus of change	Type of change
Macro-evolutionary	Industry environment	Corporate identity
Micro-evolutionary	Stage in organization's life cycle	Organizational coordination
Revolutionary	Political	Power & control

Kanter, Stein, & Jick (1992). *The Challenge of Organizational Change.* New York: Free Press.

Recent Research on Org. Change

Scope of research:

- 34 organizations surveyed by U. of Michigan
- 5 in depth case studies

Organizational change driver:

- change driven by demands of business environment
- not by intention to change the internal organization
- literature emphasizes internally driven change (little support)

Change leadership:

- change described as conversion of a top leader
- however change driven a change in the leaders

Denison (1990). *Organizational Culture and Organizational Effectiveness.* New York: Wiley

'Big 3' Model Revisited

Level of change	Focus of change	Type of change
Macro-evolutionary	Industry environment	Corporate identity
Micro-evolutionary	Stage in organization's life cycle	Organizational coordination
Revolutionary	Political	Power & control

Kanter, Stein, & Jick (1992). *The Challenge of Organizational Change.* New York: Free Press.

Some Testable SPI Hypotheses

Software processes cannot be improved if they are constantly being sacrificed to schedule pressure

Process learning occurs faster when there is a common process framework against which to compare results

SPI will not be sustained if projects do not experience benefits after reasonable time and effort

Sophisticated processes or methods must be adopted and mastered in stages

The full benefits of an individual process cannot be realized if it is improved in isolation

Conclusions

The SPI community needs to begin studying the effectiveness of the models that guide their implementation of improvement programs.

- what tools are relevant to what approaches?
- what assumptions underlie how the approach is applied?
- does the model describe the intervention or resulting behavior?
- what organizational state is most conducive to the approach?

The SPI community needs to :

- measure the results of assumptions underlying SPI programs
- characterize the capability of different improvement models
- describe how they can be integrated in SPI programs

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A Vision of the Future at SEPG?

1989 - 1996	1997 - ?	? - ?
Local learning	Community learning	Scientific learning
Case studies	Change models	Model capability
ROI reports	IDEAL	Empirical studies
2	3	4

TeraQuest 20 Models of SPI © 1997 TeraQuest

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ESEPG '97
European Software Engineering Process Group Conference

Competence in Software and Engineering - Siemens' Software Initiatives

Software & Engineering @ Siemens

Siemens' Software Initiatives:
- Impact of Software & Engineering on Siemens' businesses
- Goals and approaches
- Focus Areas
- Standards of Excellence top[Six]
- Conference "Competence in Software and Engineering"
- Group-specific Initiatives

Experience at Siemens' Public Communication Networks Group: *"Cut Cycle Time by 50% by Comprehensive Redesign of the Entire Product Life Cycle Process"*

top Software Initiative

SIEMENS

Siemens
System integrator with eight core business areas

- ❑ We are an electrical engineering and electronics company
- ❑ We are the systems integrator in the global market
- ❑ We stand for innovation and responsibility

System integrator with eight core business areas:
- ❑ Energy
- ❑ Industry and trade
- ❑ Communications
- ❑ Information
- ❑ Transportation
- ❑ Health care
- ❑ Components
- ❑ Lighting

Software is of strategic importance within numerous divisions

top Software Initiative

SIEMENS

Software Status at Siemens

Software Development has become a significant success factor in most of Siemens' business transactions

60 % of Siemens' sales are based on products / systems utilizing software developed in-house

25,000 Software designers are employed worldwide

→ **Fundamental changes made to improve both quality and efficiency in software development are becoming prime competition factors**

Software is a core competence for our business

Software competence has become a strategic goal for Siemens

top Software Initiative — Competence in Software and Engineering - Siemens' Software Initiatives — Page -3- — European SEPG '97 © Siemens AG 1997 ZT SW Ref. AV ON SN TOP GWa. 97-06-18

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The top -Software Initiative - Goals and Approaches

Keep software expertise at Siemens among the best world-wide

through:

- focussing and bundling the current activities of the groups
- derive group-specific software initiatives that focus on business-specific goals
- build up and access both internal and external knowledge bases (including benchmarking and the recognition and speedy adaption of "best practices") to enable us to innovate faster and with less risk
- continuous exchange of information and experiences regarding ways to increase software expertise, e.g. through inter-group workshops
- actively using an electronic forum on the Intranet to support the exchange of information in the "software community"
- making the software expertise of Siemens more visible externally

top Software Initiative — Competence in Software and Engineering - Siemens' Software Initiatives — Page -4- — European SEPG '97 © Siemens AG 1997 ZT SW Ref. AV ON SN TOP GWa. 97-06-18

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Siemens' Software Initiative Focus Areas

Software Initiative

- Project Management and Organization
- Architectures for Software Products
- Architecturs for Embedded Software and Systems
- Processes *(process chains, process assessments, process improvement, innovative processes)*
- Engineering for Industrial and Power Plants
- Human Resources Management
- Software Marketing / Software Service
- top^{Six}: the Siemens' Standards of Excellence

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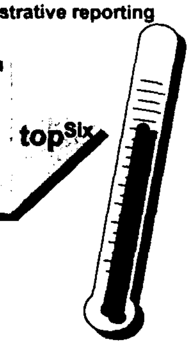
Successful Software Competence is Influenced by many Factors top^{Six} - a "Thermometer" for the Software Business

- Costs ==> via administrative reporting

- Customer satisfaction
- Time-to-market
- Quality
- Productivity
- Process Maturity
- Technology Maturity

- Human factors
- Communication
- 'Skills'
- Infrastructure



How healthy are we?

- Improvements must be measured and traced,
- for controlling purpose,
- to make visible successes and benefits.
- This requires management and controlling instruments at both project and management level.

Purposeful pursuit of objectives produces the leverage required

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top^{Six} Charts - Example

Chart 1: Customer Satisfaction *Goal: ...*

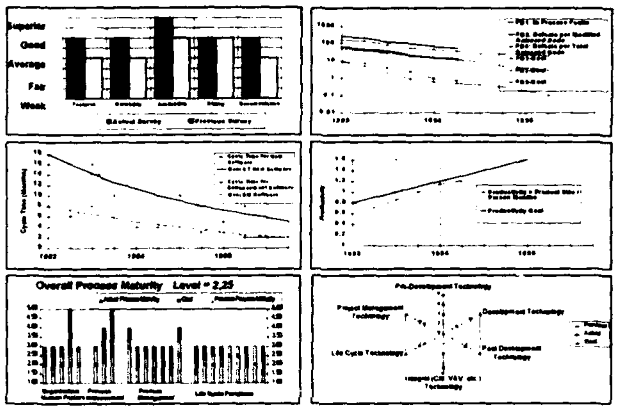
Chart 2: Quality (Process and Product) *Goal: ...*

Chart 3: Cycle Time *Goal: ...*

Chart 4: Productivity *Goal: ...*

Chart 5: Process Maturity *Goal: ...*

Chart 6: Technology Maturity *Goal: ...*



top^{Six} provides the basis for measuring and controlling software activities and initiatives

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International Siemens Conference and Exhibition Competence in Software and Engineering

- Plenary sessions
- Panel discussions
- 180 contributions, talks, poster sessions, demos
- in 24 pavilions

- 10 -11 June '97
- Munich Airport
- Siemens' groups and their operating companies, corporate divisions, Siemens International Companies

- 1000 attendees, Siemens' employees and customers from around the world

To promote:

- exchange on info and best practices
- further improvement
- further innovation
- a motivational boost to the initiatives
- make our competence more visible to our customers

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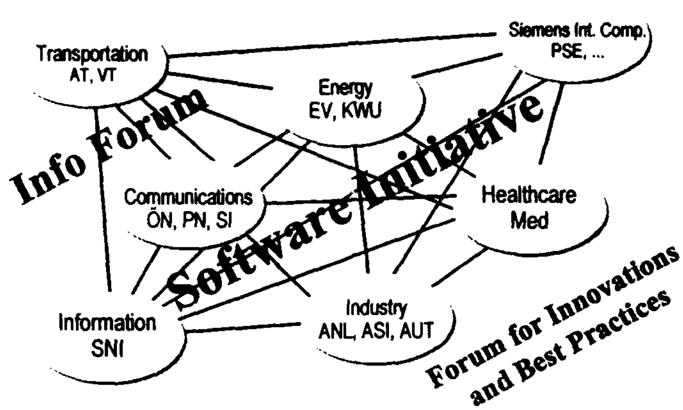
The Software Initiatives of the Groups and the Siemens International Companies



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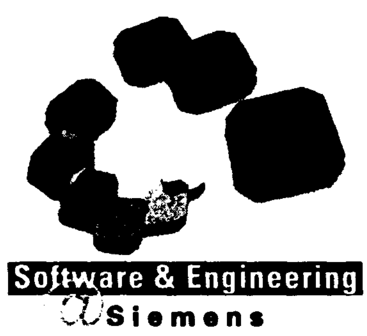
Cut Cycle Time by 50%
by Comprehensive Redesign
of the Entire Product Life Cycle Process



**The story of
the creation of optimized
processes within
Siemens' Public Communication
Networks Group (OEN)
and
their successful application to
the switching system EWSD**

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Overview

1. **Basic Situation and Requirements for the Processes**
   About products, organization and telecommunication markets

2. **The Process Redesign Project PEPP**
   About goals, phases, time frame of an ambitious project

3. **The results: New Core Processes and Optimized Process Steps**
   About Business Opportunity Scanning, Product Line Management and Product Provisioning Processes and "levers"

4. **Successful Introduction of the New Life Cycle Process**

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Siemens Public Communication Networks Group (OEN) is one of the leading suppliers in telecommunications ...

... with a wide range of products and services ...

... and a decentralized organization including 9 business units

- Access Networks (AN)
- Broadband Networks (BN)
- Internet Solutions (IS)
- Mobile Networks (MN)
- Network-Engineering (NE)
- Communication Cable Networks (NK)
- Switching Networks (SN)
- Telecom Management Networks, Intelligent Networks (TI)
- Transport Networks (TR)

O.N.E = Optimized Network Evolution

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The broad product portfolio and the decentralized organization require:

❑ **The product life cycle process**

- must be generic in essential parts and allow to create variants for different project classes
- must allow seamless continuity accross the business units in case of joint developments
- must include clear strategic target setting

Software Initiative Competence in Software and Engineering - Siemens' Software Initiatives Page -13- ZT SW Ref. AV, ON SN TOP, GWs 97-06-16

European SEPG '97

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Customer requirements for telecom equipment are extremely challenging

❑ **e.g. customer requirements for swiching systems**

- System availability >99.99943% (3 min. downtime/year)
- Permanent operating time 10 - 20 years
- System modification and expansion during operation
- New versions fully downward-compatible
- Adaptation to operator-specific standards (customer projects)
- ...

The switching system EWSD of Siemens fulfills the highest customer requirements

EWSD = Elektronisches Wähl-System Digital (Electronic Digital Switching System)

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Siemens' EWSD is the world's best selling switching system

❑ Installed ports today

- 710 million ports worldwide

EWSD market share:

- 130 million ports
- 92 countries
- 300 operating companies

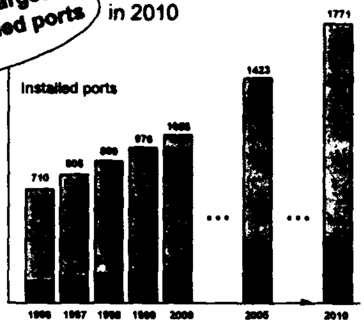
EWSD has the largest number of installed ports today

❑ EWSD success factors

- Annual release of an extended SW version
- Hardware modernization every 3 years
- Use of the most modern and efficient microelectronic components
- Setting of standards with fully customized chipsets (ISDN)
- Highest reliability

❑ The prognosis

1.8 billion ports worldwide in 2010



The goal is to increase the EWSD market share in future

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To stay competitive and to increase market share require:

❑ The product life cycle process must include

- ➡ search for new business opportunities independent from operational sales task
- ➡ customer-oriented evaluation of realization alternatives
- ➡ close cooperation with the customer
- ➡ a maximum of parallelism of the subprocesses
- ➡ cross-functional project control with overall responsibility

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The situation in the telecommunication market has changed dramatically in the past few years ...

- Traditional markets are saturated
- Considerable price-pressure in young markets
- New operators and globalized activities of traditional operators because of market deregulation
- Globalization of competitors
- Telecommunication and information technology are growing together

... and will remain turbulent in the forseeable future

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SIEMENS

The dramatic changes in the telecommunication market requires:

❑ **The product life cycle process**

- ➡ must shorten the time to market
- ➡ must drastically reduce the throughput times
- ➡ must increase productivity to reduce investment for new products
- ➡ must target the product life cycle to design to cost, design to service and design to customers need

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Overview

1. **Basic Situation and Requirements for the Processes**
   About products, organization and telecommunication markets

2. **The Process Redesign Project PEPP**
   About goals, phases, time frame of an ambitious project

3. **The results: New Core Processes and Optimized Process Steps**
   About Business Opportunity Scanning, Product Line Management and Product Provisioning Processes and "levers"

4. **Successful Introduction of the New Life Cycle Process**

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SIEMENS

PEPP should optimize the processes in order to cope with the of product, organization, and market requirements

❑ **The most important goals of the PEPP project:**

- More accurate product definition to guarantee market success
- Shorter cycle times to accelerate innovation

- Reduced cost and increased productivity to set resources free for new products

PEPP = Produkt Entstehungs Prozess Plan

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The PEPP project has been subdivided into 3 phases

Phase 1: Project definition	Phase 2: Work out improvements	Phase 3: Realisation
● Detection of problem areas ● Definition of "levers" (areas of improvement) ● Installation of cross-functional teams and of a steering committee	● Detailed analysis of quality, cost and throughput time of exixting process steps ● Work out of improvement measures in teams, resulting in: - new processes, - optimized steps of existing processes - new or improved methods ● Release of improvements by steering commettee	● Verification of improvements in pilot projects ● Tuning of measures according to the experiences ● Full roll-out, including provision of process documentation

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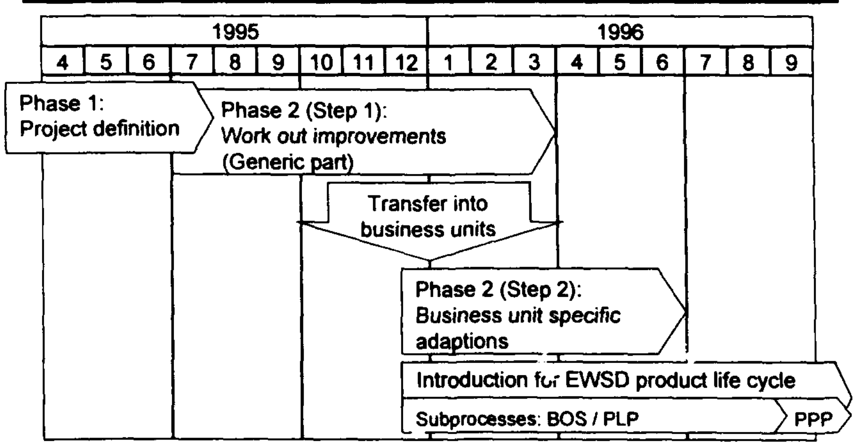
The PEPP project was started 12/94, the new processes were introduced for EWSD in 1/96



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SIEMENS

The new product life cycle consists of 3 closely interacting core processes

Product Line Management Process (PLP)

Business Opportunity Scanning Process (BOS)

Product Provisioning Process (PPP)

- Development (PPP:D)
- Market Introduction (PPP:M)
- Production Introduction (PPP:P)
- OEM Integration (PPP:O)

SIEMENS

The BOS process involves continuously and proactively searching for new business opportunities

The 4 phases of the Business Opportunity Scanning Process (BOS):

1	2	3	4
Recognize business opportunities	Formulate business opportunities	Conduct feasibility studies	Draw up a business plan

BOS ensures more accurate product definition

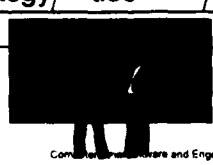
SIEMENS

In the PLP process an entrepreneurial product line strategy is formulated and implemented

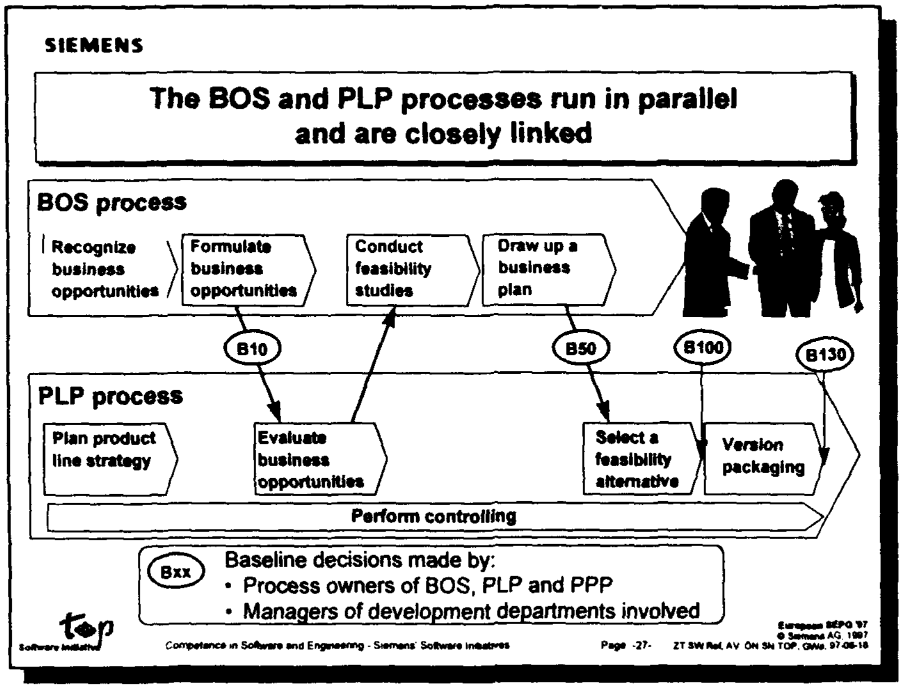
The phases and process steps of the Product Line Management Process (PLP):

1	2	3	4		(5)
Plan product line strategy	Evaluate business opportuni-ties	Select a feasibility alternative	Version packaging	...	Product phase-out

Controlling



PLP ensures cross-functional project control


SIEMENS
The BOS and PLP processes run in parallel and are closely linked
BOS process
Recognize business opportunities
Formulate business opportunities
Conduct feasibility studies
Draw up a business plan
B10
B50
B100
B130
PLP process
Plan product line strategy
Evaluate business opportunities
Select a feasibility alternative
Version packaging
Perform controlling
Bxx
Baseline decisions made by:
• Process owners of BOS, PLP and PPP
• Managers of development departments involved
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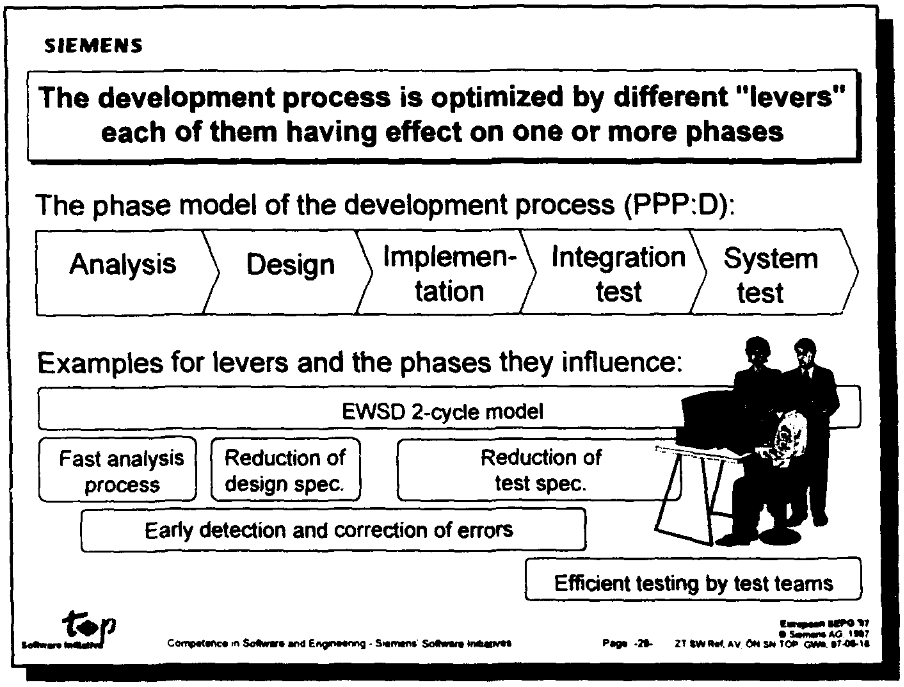
SIEMENS
The development process is optimized by different "levers" each of them having effect on one or more phases
The phase model of the development process (PPP:D):
Analysis
Design
Implementation
Integration test
System test
Examples for levers and the phases they influence:
EWSD 2-cycle model
Fast analysis process
Reduction of design spec.
Reduction of test spec.
Early detection and correction of errors
Efficient testing by test teams
Competence in Software and Engineering - Siemens' Software Initiatives
Page -28-

SIEMENS

The lever "fast analysis process" accelerates the analysis phase by 50%

Basic principles / goals:

- Redesign and acceleration of analysis phase
- Link between BOS / PLP processes and the development process

Process modifications:

- Direct information passing by business opportunity handover workshops
- Reduction of documentation volume (Delta feature specs. instead of complete system functional specs.)
- Non-urgent activities in later phases (e.g. updating of system specs.)

SIEMENS

The lever "efficient testing by test teams" reduces throughput time and costs for the test phases

Basic principles / goals

- Redesign and more efficient processing of the test phases
- Formation of feature-group-oriented test teams out of development and system test staff
- Reduction of testing volume by elimination of redundancies
- Cost saving by reduction of test beds

Process modification:

- "Clearing out" of milestones in test phases
- More parallelism between integration test and system test
- Use of testing teams for common test steps of test phases

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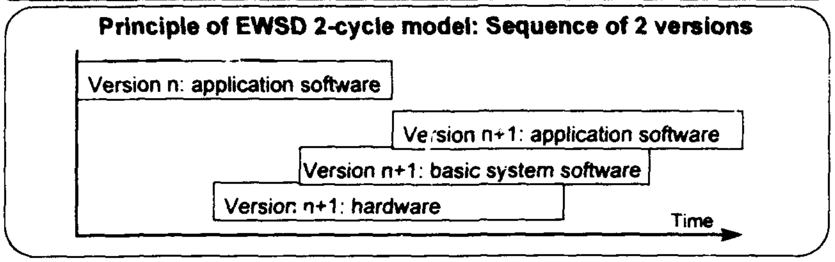
The "EWSD 2-cycle model" is a strategy to apply the development process to series of EWSD versions



Basic principles / goals:

- Decoupling of basic system SW and application SW, and of HW
- Basic system SW and HW modifications only in every second version

Process modifications:

- Sequential start of HW, basic system SW and application SW in combined version
- Defined milestones for synchronizing HW, basic system and application SW

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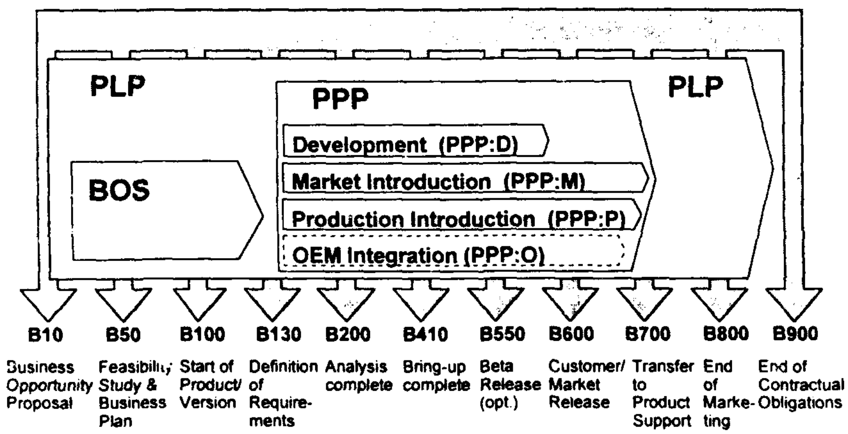
Synchronization points allow seamless continuity across the business units in case of joint development



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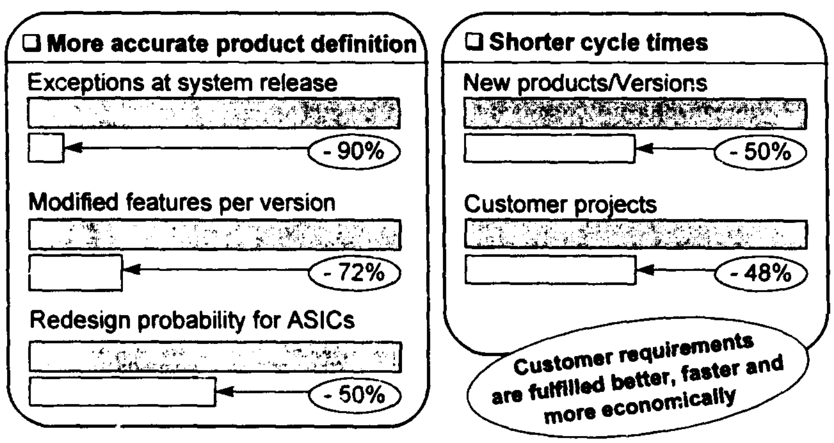
SIEMENS

The new product life cycle process has been successfully introduced



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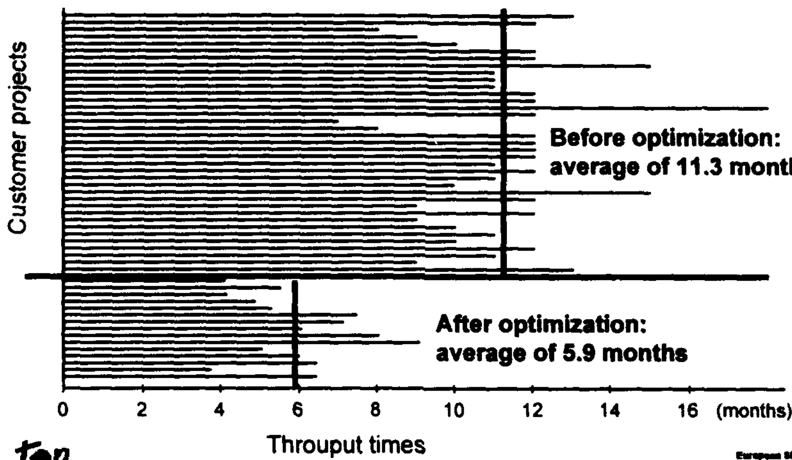
For EWSD customer projects throughput times have been cut by an average of 48%



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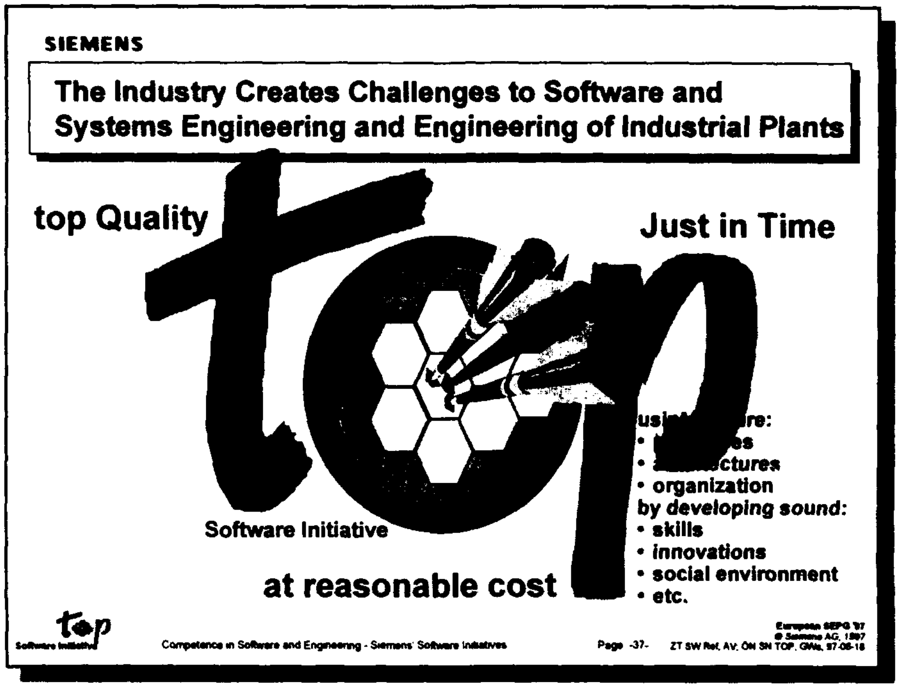
The new product life cycle processes have been accepted immediately by 94% of the staff

❑ Success factors of the process redesign project:

- Many of the people who now have to live with the new processes were involved in the cross-functional project teams
- High identification with the project goals caused by intensive communication and careful explanation
- Good support by the management
- Up-to-date electronic documentation system with hyperlinks
- Training courses held by people involved in the project
- Clear responsibility for the new core processes (process owners)
- Continuous improvement process integrated

The real goal is not a dramatic, but unique increase of efficiency but a continuous process improvement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The Industry Creates Challenges to Software and Systems Engineering and Engineering of Industrial Plants
top Quality
Just in Time
• organization
by developing sound:
• skills
• innovations
• social environment
• etc.
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at reasonable cost
top
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KEN TAYLOR

PEOPLE AND RESOURCES DIRECTOR

POST OFFICE IT SERVICES

THE POST OFFICE

POST OFFICE

Royal Mail

PARCEL FORCE

MANAGING CULTURE CHANGE

Why do it?

It's Fun!

Everyone's doing it!

I'm a bored executive!

outside looking in

MANAGING CULTURE CHANGE

Why do it?

It leads to competitive advantage

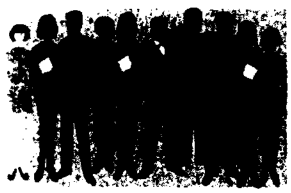
outside looking in

MANAGING CULTURE CHANGE

Who makes the change work?

The managers?

The Customers?



NO! It's the staff

outside looking in

MANAGING CULTURE CHANGE

The Approach

Boring - We're drawing up a process map of the organisation

ZZZZZZZZZZZ

Interesting - We're finding out how things work round here

WOW

outside looking in

MANAGING CULTURE CHANGE

The Approach

Boring - We're embarking on a programme of continuous improvement
YAWN

Interesting - We're going to make a few things better round here
ZAP

outside looking in

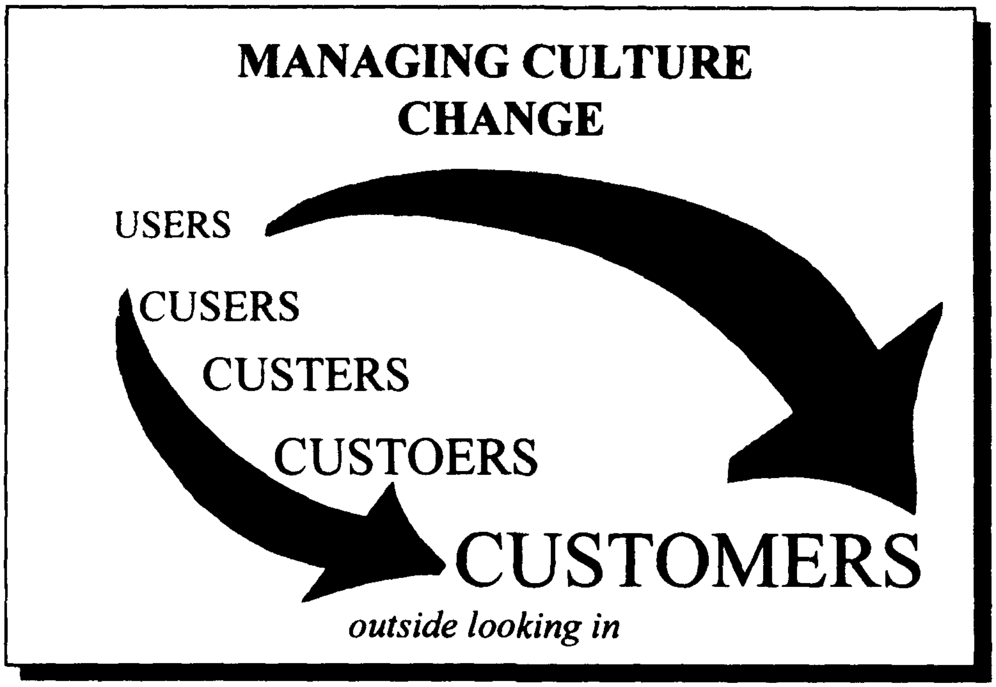
MANAGING CULTURE CHANGE

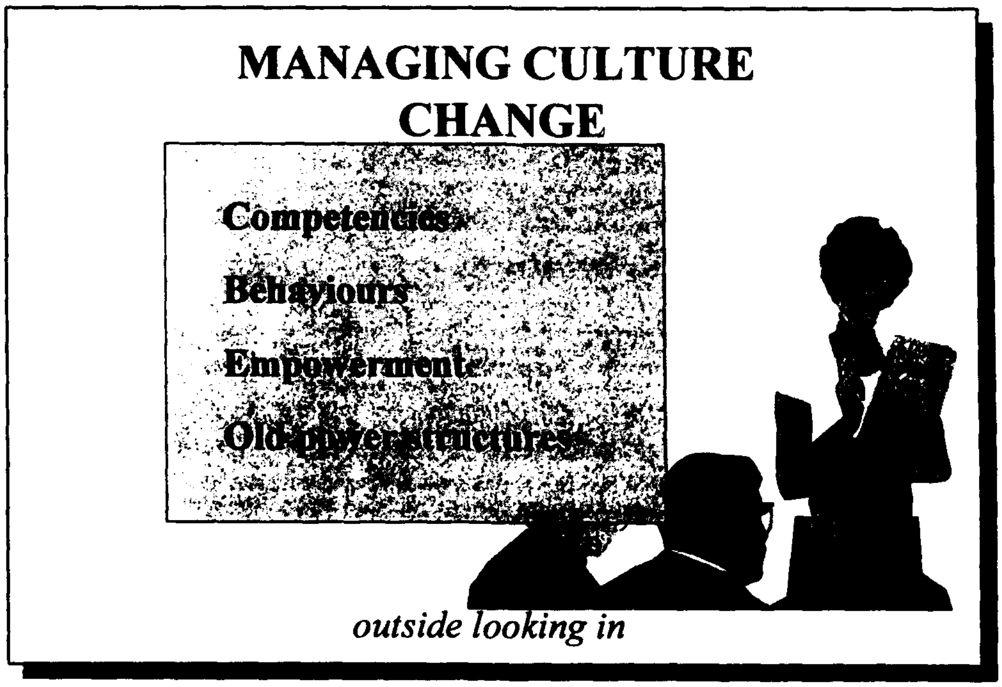
The Approach

Boring - The Executive Committee are having a 3 day workshop to develop the programme
Here we go again

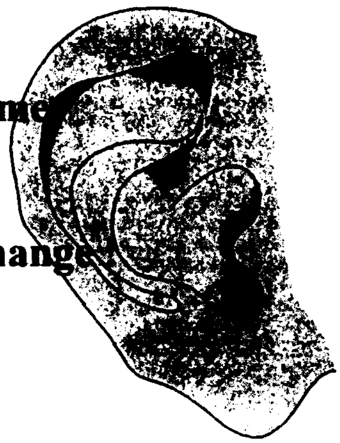
Interesting - You're going to have to tell us the best things to attack
Do they mean us?

outside looking in


MANAGING CULTURE
CHANGE
USERS
CUSERS
CUSTERS
CUSTOERS
CUSTOMERS
outside looking in


MANAGING CULTURE
CHANGE
Competencies
Behaviours
Empowerment
Old power structures
outside looking in

MANAGING CULTURE CHANGE



Evolved with the Customer

The right name

Change programmes change

Change is continuous

outside looking in

MANAGING CULTURE CHANGE

Better business solutions

Service excellence

Responsiveness

Personal leadership

Performance management

outside looking in

MANAGING CULTURE CHANGE

Better business solutions means -

Change the culture
Understand the customer
Understand their business
Customer obsessed behaviours

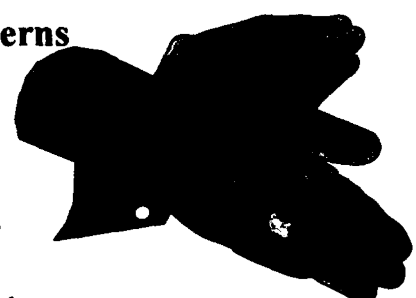
outside looking in

MANAGING CULTURE CHANGE

Service excellence means -

Listen to customer concerns
Do something about it
Get customer approval

Stick to the priorities



outside looking in

MANAGING CULTURE CHANGE

Responsiveness means -

Skills groups
Assignment based working
Flexible organisation

outside looking in

MANAGING CULTURE CHANGE

Personal leadership means -

We're all being watched
Define good behaviours
Reward the good ones correct the bad

Get feedback

outside looking in

MANAGING CULTURE CHANGE

Performance management means -

Proper measurement
Proper feedback
Proper coaching
Done by the capable

A continuous process

outside looking in

MANAGING CULTURE CHANGE

SUMMARY

Change is continuous
Customer expectations grow
Old behaviours need examination
People need help to respond

outside looking in

MANAGING CULTURE CHANGE

We all know that we need to change the culture

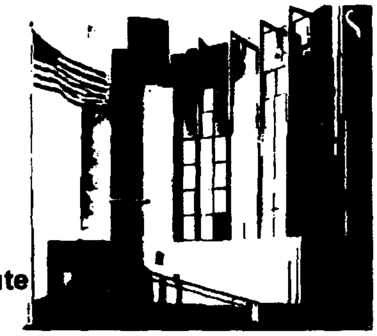
The secret is to do it *with* the organisation not *to* the organisation

outside looking in

Carnegie Mellon University
Software Engineering Institute

Software Measurement Across a Global Enterprise

Interim Report



ESEPG 97
June 16-19, 1997

Gerald Pasternack, Citicorp
Dave Zubrow, SEI

Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15213

1

Carnegie Mellon University
Software Engineering Institute

Overview

- **Background information**
  - why enterprise-wide measures
  - infrastructure
- **Enterprise measures selected**
- **Challenges, obstacles, & solutions**
- **Status**
  - pilot implementation
  - next steps

2

Enterprise

Objective

To establish an enterprise metrics program which characterizes software progress and performance across a global enterprise

To establish initial, simple set of metrics that can be used across the enterprise to serve as the common "meter stick".

To deploy this so that all organizations (at CMM Level 3 and higher) can utilize this program as part of their ongoing improvement efforts

3

Citicorp Overview

A full service *global* bank --> 85,000 staff, with more than 3,500 locations in 96 countries

Strong technology thrust

- 6,000 developers across the world
- wide range of development projects

Strong commitment to elevating the level of software maturity. Using CMM as roadmap. More than 50 Assessments to date:

- 63% at L1; 17.4% at L2; 15.2% at L3: 4.4% at L4
- challenge is for all Organizations to be at L3 (or higher)

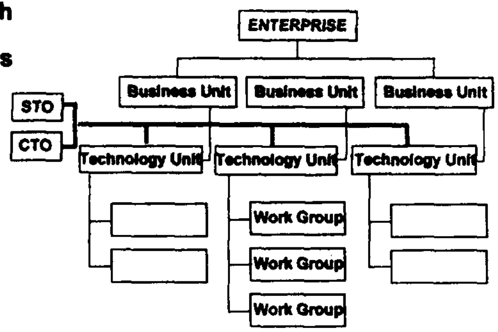
4

Citicorp as a Global Enterprise

Multiple Business Units each drive development via associated Technology Units (TU)

Each TU may have several multi-national teams (Work Groups)

Senior Technology Officer (STO) provides technical oversight via Citicorp Technology Office (CTO)



5

Why Enterprise-Wide Measures

Ability to answer questions about the enterprise

- are we getting better or getting worse
- is an enterprise-wide improvement program having an effect

Powerful ability to evaluate new technologies, methods, and practices by:

- collecting identical measures to enable meaningful comparisons and trend analysis
- creating a large pool of project data from which similar projects can be chosen for comparison purposes

Establish a visible ongoing enterprise focus for software engineering excellence

6

Benefits To The Enterprise -1

Establishes a "baseline" from which to measure

Provides a basis for inter-organizational comparisons

Identification of "best practices" and a starting point for enterprise communication and contacts

Organizational alignment around common measurement processes and objectives

Begins to build an enterprise metrics database for benchmarking comparisons

7

Benefits To The Enterprise -2

Measure progress towards Corporate improvement goals

- increase Productivity by a factor of 2 over 5 years
- improve Quality by a factor of 10 over 7 years
- improve Predictability to within 5% over 7 years
- reduce Development time by 40% over 7 years
- reduce Maintenance effort by 40% over 7 years

8

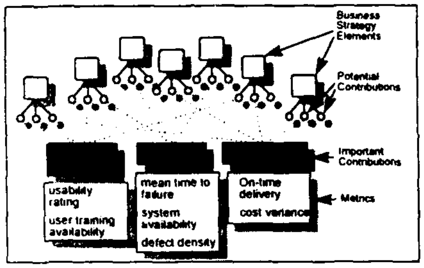
Enterprise

Benefits to the Technology Units

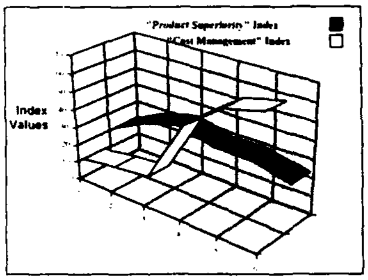
- Augments measurement work already in progress within individual organizations
- Provides closer alignment to business goals
- Able to more easily track progress, priorities, and trade-offs in a systematic manner
- Serves as a datum point for technology upgrade
- Shares the workload in developing detailed measurement standards

9

Business Strategy Mapped to Metrics



Example Indices for Business Goals



Traceability table

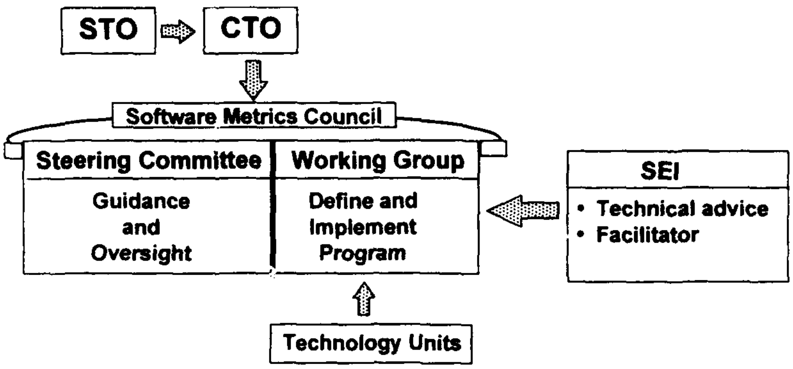
Indicators \ Business Goals	Globality	Product Superiority	Improve Cost Management	Customer Focused Culture	etc	
Schedule predictability	●	●				
Effort predictability					●	
Development time	●	●		●		
Quality	●	●	●			
Project mix						●
Productivity			●		●	
Maintenance effort			●			
Customer satisfaction		●		●		
Employee satisfaction						●

10

Infrastructure

Established a Software Metrics Council (SMC)

- Steering Committee
- Working Group



11

Software Metric Council

Chartered for the benefit of Technology Units across Citibank to provide an enterprise focus on fundamental software metrics

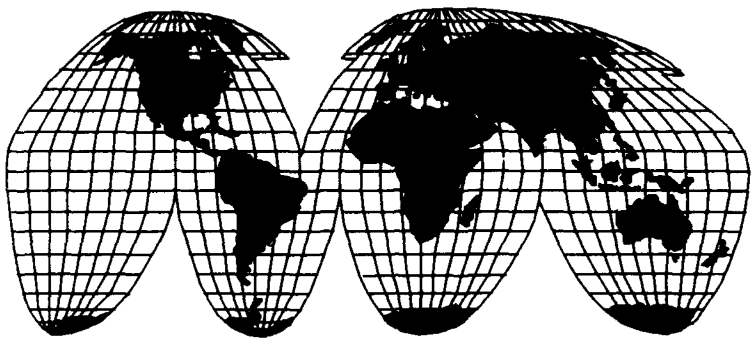
SMC Membership invited from Citibank's highest maturity Organizations (Level 2+, 3, and higher)

- each Unit participates both as a member of Steering Committee and Work Group
- augmented by CTO and SEI consultants

SMC builds upon CMM, as well as the work of the individual Units. Extends this to establish a corporate metrics baseline

12

Enterprise Metrics Program
Participating Citicorp Sites



★ Participating Sites

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Carnegie Mellon University
Software Engineering Institute

Overview

Background information
- why enterprise-wide measures
- infrastructure

➡ **Enterprise measures selected**

Challenges, obstacles, & solutions

Status
- pilot implementation
- next steps

14

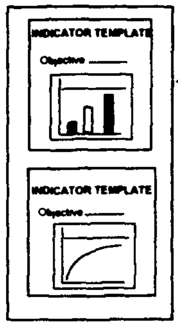
Goal Driven Metrics

Objective

Establish initial, simple set of metrics that can be used across Citibank to serve as the common "meter stick".

Goals

- STO Improvement Goals
- Technology Units Goals



Evaluation Areas

15

Selection of Indicators

Evaluation areas

- can indicator be interpreted correctly?
- does it provide an accurate and high-level view?
- could you collect the data in your organization?
- are there any major barriers?
- do the definitions provide enough information?

Other considerations

- number of indicators in each measurement area
- total number of indicators

16

Enterprise Profile Initial Core Measures

Schedule predictability. Indicator designed to answer questions about the enterprise(s) ability to plan well and deliver the products on schedule

Effort predictability. Indicator designed to improve cost estimation and the ability to bring projects in on budget.

Cycle time. Indicator used to track improvements in getting products to market as quickly as possible.

Quality. Indicator for the quality of the development and testing process as well as the quality of the software in the field.

Maintenance Effort. Indicator used to track non discretionary maintenance, enhancements, and defect corrections as well as the number of open trouble reports.

17

Enterprise Profile - 2

Customer satisfaction. *An indicator* to track two components of customer satisfaction - satisfaction with the implemented solution and the working relationship with the implementing team

Cost of Quality. An indicator that breaks overall costs (effort hours) into:

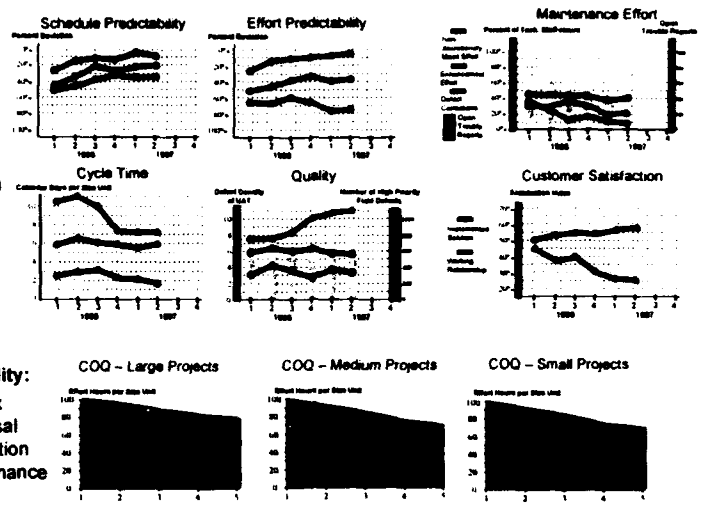
- rework - effort for fixing defects discovered prior to release
- appraisal - effort for inspection and testing
- prevention - effort incurred by process improvements aimed at preventing defects
- performance - effort associated with building the product

18

Citicorp Enterprise Metrics

Project Size:
- Small
- Medium
- Large

Cost of Quality:
- Rework
- Appraisal
- Prevention
- Performance



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Carnegie Mellon University
Software Engineering Institute

Overview

Background information
- why enterprise-wide measures
- infrastructure

Enterprise measures selected

➡ **Challenges, obstacles, & solutions**

Status
- pilot implementation
- next steps

20

Challenges, Obstacles, & Solutions

Precise definitions

Culture differences

Trying for the 100% solution

Keeping senior management involved

Working open issues

21

Precise Definitions

Problem

- different business concerns, processes, native languages, cultures
- what is a project

Approach/Solution

- heavy reliance on
  - checklists
  - templates
  - graphics
  - handbook
  - education -> metrics course

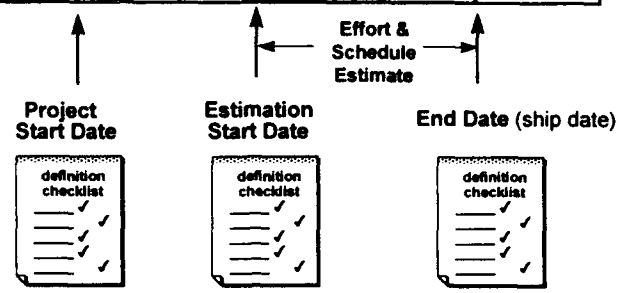
22

Precise Definitions - 2

Key dates - start and end times

Project Phases

Feasible Study	Alternative Analysis	Functional Specification	Design	Code & Unit Test	Integration Test	UAT	Deployment
Initiation		*Definition*	*Design*	*Build*	*Verification*		*Implementation*



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Staff-Hour Definition Checklist

Page 3

Page 2

Staff-Hour Definition Checklist

Hours related to specific project	Totals include	Report totals
Activity		
Development		✓
Primary development activity	✓	
Development support activities		
Concept demo/prototypes	✓	
Tools development, acquisition, installation, & support	✓	
Nondelivered software & test drivers	✓	
Maintenance		
Non-discretionary		
Defect correction (bug fixes)	✓	✓
Other		✓
Regulatory/compliance	✓	
Release upgrade	✓	
Interface (external and internal)	✓	
Enhancements		✓
Legacy Systems	✓	
Non-Legacy Systems		
Employment Class		
Citicorp employee		
Full time	✓	
Part time	✓	
Temporary employee	✓	
Subcontractors	✓	
Consultants	✓	

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Indicator Templates

INDICATOR TEMPLATE

Objective ________________

Questions ________________

Visual Display

Input(s)

- **Data Elements** ________________
- **Responsibility for Reporting** ________________
- **Form(s)** ________________

Algorithm ________________

Assumptions ________________

Interpretation ________________

- **X-reference** ________________
- **Probing Questions** ________________
- **Evolution** ________________

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Example of Indicator Template
(Page 1)

Cycle Time

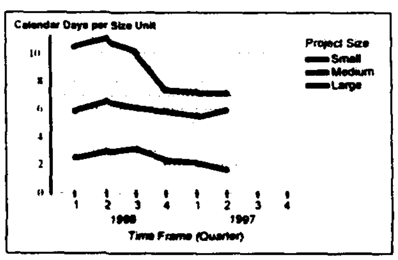
Objective

To monitor trends in development elapsed time as input towards improvement at the technical unit level and across the Enterprise.

Questions

- What is the cycle time trend for each of the project size categories?
- Are the trends the same for the different project size categories?
- What is the rate of change from year to year?
- How does the rate of change compare between the different project size categories?

Indicator/Display



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Handbook

Software Metric Council Working Group

Initial Core Metrics

Handbook Contents

- Citicorp Enterprise Metrics
- Indicator templates
- Definitions
- Definition checklists
- Pilot Deployment Indicator Assignments
- Pilot Deployment Expected Output
- Charter

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Metrics Course (First Draft)

Purpose:

- ensure common understanding, implementation, and interpretation of the metrics across the Organization
- broadcast feedback & lessons learned from pilot implementation

Components

- description of template for each indicator
- definitions & checklist
- outline of Data Analysis module
  - evaluating technology and process changes
  - using the indicators to guide actions
  - analyzing trends

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Culture Differences

Problem
- what is accepted in one culture, may not be accepted in another (e.g. measurement of effort)
- acceptance of measurement
- English not native language for all

Approach/Solution
- education/training
- frequent meetings
- expanded scope of involvement

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Trying for 100% Solution

Problem
- so much diversity, can not capture everything
- if waiting for 100% solution, may never get there

Approach/Solution
- concentrate on 80% solution
- find out how common everything is (languages, etc.)
- expect several iterations
- start with easy metrics
- expand to meet business needs

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Example: Selection of Unit of Size

PRO — **SLOC** — **CON**

PRO:
- Relatively inexpensive to count
- Tools fairly easy to write

CON:
- Many different languages
- 4GL, visual actions, code generators, etc.

PRO — **Function Point** — **CON**

PRO:
- language-independent
- comparability issues minimized

CON:
- Higher training cost
- Possible higher counting costs

PRO — **Local Choice** — **CON**

PRO:
- Measure will fit local environment
- generally low cost initial implementation

CON:
- Comparability is major headache
- Little opportunity for sharing

Keeping Senior Management Involved

Problem
- oversight by senior management is difficult
- meetings involve heavy time commitments (long travel times)
- how to obtain & retain support of the metrics program through all levels of the organizations

Approach/Solution
- Steering Committee met in conjunction with other business meetings
- periodic status reports
- select metrics that serve several levels of the business to ensure maximum support
- must gain support of business sector

Working Open Issues

Problem

- no common reporting structure
- no mechanism in place to track, work, or coordinate solutions
- timely communication
  - different time zones
  - no common "connectivity" for Working Group members

Approach/Solution

- the CTO office and SEI consultants played this coordination role
- frequent communication via FAX, Federal Express, Email, conference calls, internet

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Carnegie Mellon University
Software Engineering Institute

Overview

Background information

- why enterprise-wide measures
- infrastructure

Enterprise measures selected

Challenges, obstacles, & solutions

Status

- pilot implementation
- next steps

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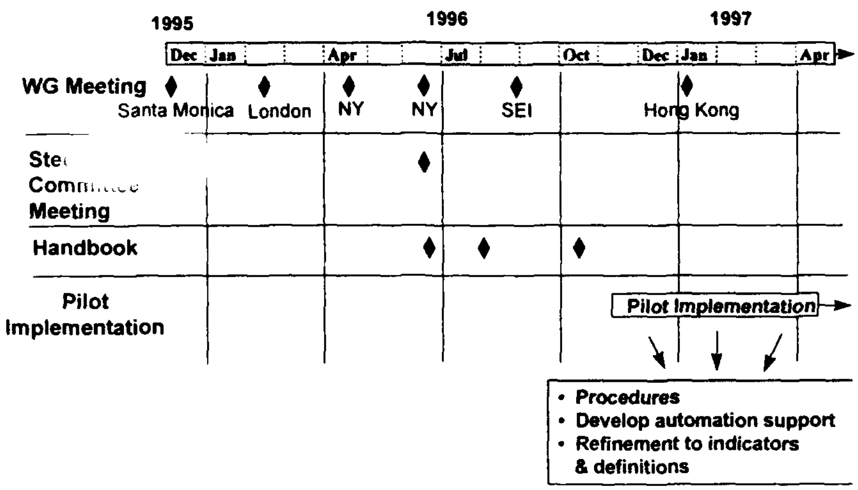
General Timeline



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Pilot Deployment Goals

Use and refine the set of measurement templates

Standardize detailed definitions across organizations and templates

Solicit feedback on operational characteristics and implementation issues (e.g., effort, cost)

Gain a better understanding of effectiveness and interaction of the proposed measures

Develop supporting automation

Consolidate working documents, processes, and tool kit to be used for training and future implementations

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Develop Operational Aspects

Procedures for data collection and recording

Forms for collecting and recording data

How data will be stored and accessed

Who will collect, store, and access data

Tools to aid in collection and analysis

Roll up procedures

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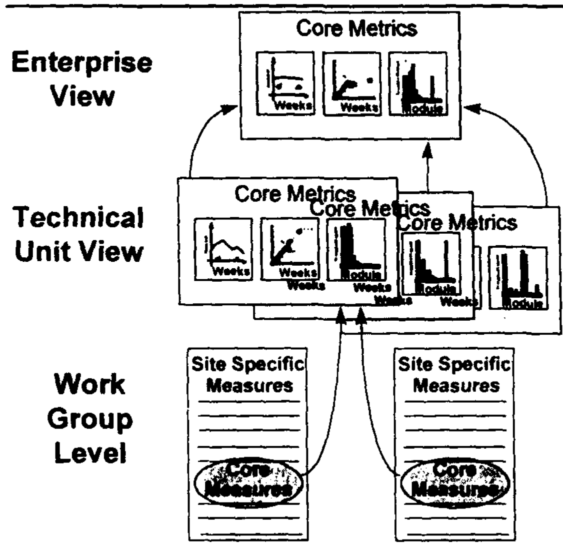
Data Roll-up



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Automation Support

Features of support program

- visual display of all the indicators
- description and algorithm used for the display
- number of projects include in each data point
- interpretation guidelines
- definitions
- display of data used in indicator
- side by side comparison charts
- own contributions vs enterprise

Program developed by GCB-India

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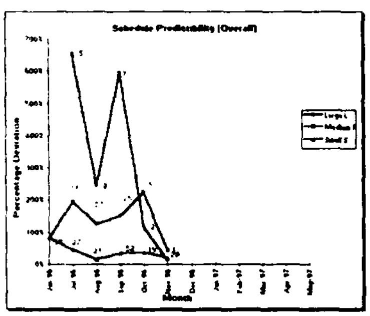
Example Output

Schedule Predictability

The Objective is to understand the effectiveness of our ability to estimate schedule. Here the input are the scheduled data when the user acceptance test (UAT) was to be completed and the actual date when the UAT was completed along with the start date of coding of the project.
The Percentage Deviation in schedule for different categories is calculated as follows:

$$\text{Percent Deviation} = \frac{\text{Absolute value (Actual Ship date - Planned Ship date)}}{\text{Planned Ship date - Start date of coding}} * 100$$

A downward trend predicts improvement in the predictability and an upward trend shows a decline in predictability. CIT will be able to improve its ability to predict schedules for completion of projects if we monitor this metric over a period of time.



Month	Large L	Medium M	Small S
Jun-96		79.54%	82.00%
Jul-96	654.57%	196.96%	45.00%
Aug-96	243.55%	125.79%	14.00%
Sep-96	595.19%	149.00%	34.00%
Oct-96	117.23%	225.00%	36.00%
Nov-96	11.11%	43.00%	20.00%
Dec-96			
Dec-96			
Jan-97			
Feb-97			
Mar-97			
Apr-97			
May-97			

Data for illustrative purpose only

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Pilot Implementation

Attributes	
• Dates, planned & Actual • Effort, code-> testing	**Group 1** • Schedule Predictability • Effort Predictability • Cycle Time
• Defects, UAT & field • Effort, development	**Group 2** • Quality • Cost of Quality
• Effort, Maintenance	**Group 3** • Maintenance Effort
• Survey Data	**Group 4** • Customer Satisfaction

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Next Steps

Report to Steering Committee
- definitions & templates
- lessons learned
- training & deployment plans

Establish governance, centralized administration of the program, forum for sharing the information

Deploy enterprise wide

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Summary

- Culture is a major issue, plan to address it throughout
- Impossible to obtain the 100% solution, 80% may be good enough
- Return value to every level from individual to enterprise
- Implementation may take a long time
- Use pilot implementation to verify feasibility

Process -> procedures -> tools -> presentations -> analysis

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Ethics and the Software Process

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 1

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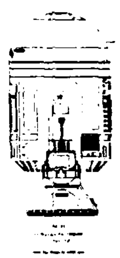
Asimov's three laws of robotics



1. A robot may not injure a human being or through inaction allow a human being to come to harm
2. A robot must obey orders from a human being provided those orders do not conflict with the first law
3. A robot must protect itself provided this does not conflict with either of the first two laws

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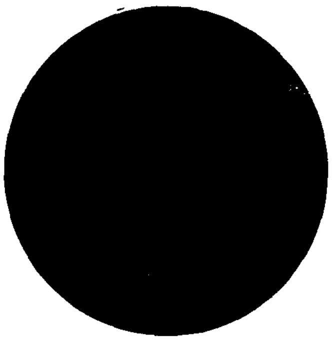
The 0th law



A robot may not injure humanity or through inaction allow humanity to come to harm

 3

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The way stuff *really* happens

 4

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A hierarchy of understanding

Data

Order

Information

Experience

Knowledge

Integration

Wisdom

 5

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Software is ...

Invisible

Intangible

Intolerant

Indispensable

..... and totally amoral

Which makes it bloody dangerous.

 6

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Ethics is ......

- Doing good
- Being honest, trustworthy and loyal
- Not screwing people
- Only screwing the competition
- Letting the competition screw you
- Doing the right thing
- Doing things right

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Project Success(1)

Doing the right thing		Doing things right: *YES*	Doing things right: *NO*
	YES	RR	RW
	NO	WR	WW

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Project Success(2)

Compliance with procedures

Fitness for purpose		*YES*	*NO*
	YES	**RR**	**RW**
	NO	**WR**	**WW**

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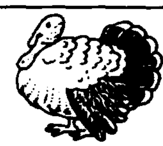
Process and Product quality

Process Axis

Doing things the right way
- i.e. complying with 'best practice'

Product Axis

Doing the right thing - i.e. delivering product which is fit for its intended purpose

	YES	*NO*
YES	The right thing done the right way	The right thing done the wrong way - good product produced by poor process
NO	The wrong thing done the right way - useless product produced by good process	

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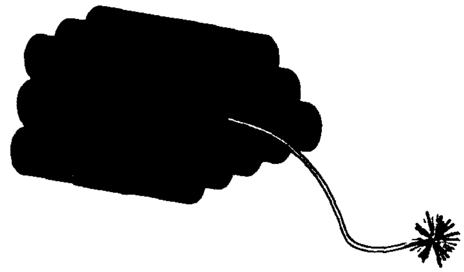
Light the blue touchpaper and stand well clear...



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The dilemma

The release of atom power has changed everything except our way of thinking....

If only I had known to what my research would lead I would have become a watchmaker

Albert Einstein

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Operational States

- Use
- Abuse
- Failure

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Problems of use

CFCs	Tobacco
Credit reporting	Lotus 'Households'
Social change	

Problems of abuse

Diamorphine	Nuclear fission
Internet	SABRE
'Chipping'	'Tagging'
System intrusion	

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Failure to understand the problem

Iatrogenics

Year 2000

Failure of the Software

AT & T / DSC Switch

Failure of the System

London Ambulance

Intel's *'Chipwreck'*

USS Vincennes

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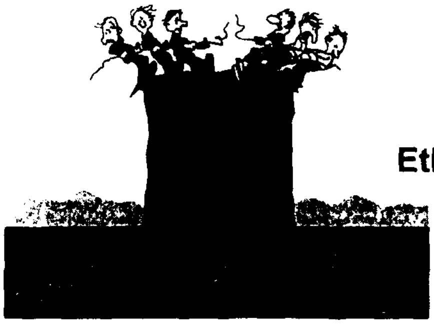
Conflicts



Ethics of duty

vs.

Ethics of consequence

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Omission and commission.

We have left undone those things which we ought to have done, and we have done those things which we ought not to have done, and there is no health in us...

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To whom do you owe the duty?

The company

The customer

The regulator

The user

Your grandchildren

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The Stakeholders

You

Line Management

Passers by

Shareholders

Users

Suppliers

Society

Me

Environment

Customers

Employees

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Effect / Probability / Action Grid (by stakeholder)

Probability

Very likely | Possible | Unlikely | Negligible

Effect

Fatal

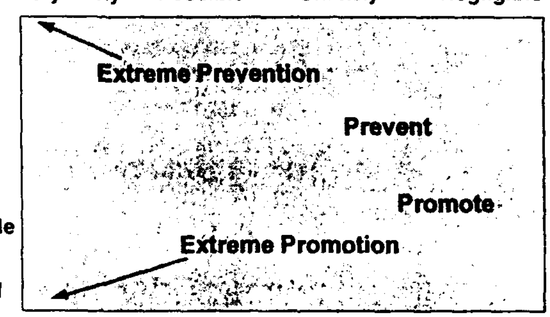
Severe

Slightly Negative

None

Favourable

Highly Beneficial



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A Key Process Area
- Ethics Management

To establish a process whereby the probability and severity of effects of use, abuse and system failure of the software under development are assessed from the viewpoint of every stakeholder and that outstanding risks are managed appropriately

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System proving

Proving that the system will behave in the intended way does not mean that it will do what you intended it to do.

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Risk

How much risk do you *like* taking?

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Attitudes to disaster

From the dawn of time until a few years ago - *"Act of God"*

From a few years ago to the foreseeable future - *"Who can I sue?"*

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Consumer Protection Act 1987

Unnecessary to show negligence

Only requirements are:

the product was defective

the defect caused the damage

... liability is .. imposed on the producer of the product (DTI guide to the act)

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Negligence (1)

In defence, the burden is on the manufacturer or designer to show that they took reasonable care.

... 'best efforts'....

.... the 'state of the art' defence' ...

(Standards & practices)

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Negligence (2)

"A design which departs substantially from relevant engineering codes is prima facie a faulty design...."

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Some other concerns

CIA (Confidentiality, Integrity & Availability)

Ownership

Power and Monopoly

Professional ethics / Codes of Conduct

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Professional ethics

First, do no harm

Be competent

Uphold the law

Be honest

... and contribute ...

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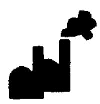
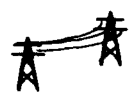
Agenda

- ABB - the company
- History of SPI initiatives within ABB
- CMM assessments the ABB way
- TOPP - the Swedish SPI initiative
- SWITCH - the Swiss SPI initiative
- TOPP - SWITCH similarities and diffences
- Lessons learnt

Winifred Menezes

ABB Corporate Research
EuroSEPG/97-06-18/1

ABB: A Short Summary

- Employees: 215 000 in more than 100 countries
- Revenues: 34 MUSD
- Example Products
  - Power Generation: Power Plants 
  - Power Transmission and Distribution: High-Voltage Substations 
  - Industrial and Building Systems: Drives, Process Automation Systems
  - ADtranz (50:50 joint venture with Daimler-Benz): High-Speed Trains 

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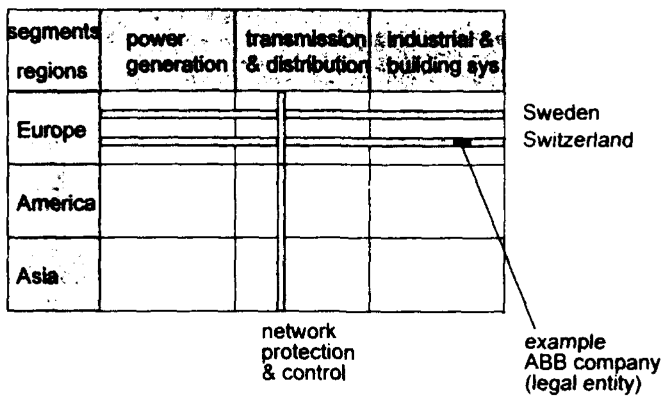
ABB's Matrix Organisation



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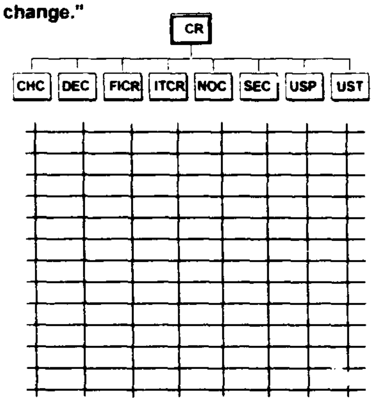
**Most R&D is carried out within the business areas.
Corporate Research (CR) spending is only a small part of overall R&D spending.**

CR Programs: "Key technologies that improve ABB's competitive advantage."

APC & WT
Comb. & FD
CCIL
El. Syst.
ESI
ESE
HTM
Insul. Syst.
MMC&C
Mechanics
Power El.
Sensors
Signal P&C
Sim. & HPC
Software Engineering

CR Centers: "Central resources, experience transfer, catalysts for change."



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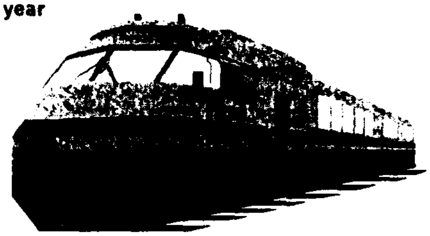
Software trends within ABB

1984

1 person year



1994

approx. 20 person years

3 % of the order value
30 % of the development costs

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Situation at ABB

BC - AC

80 % av 200 top managers
65 % av 5 000 middle managers
50 % av 50 000 engeneers

have not used computers during training

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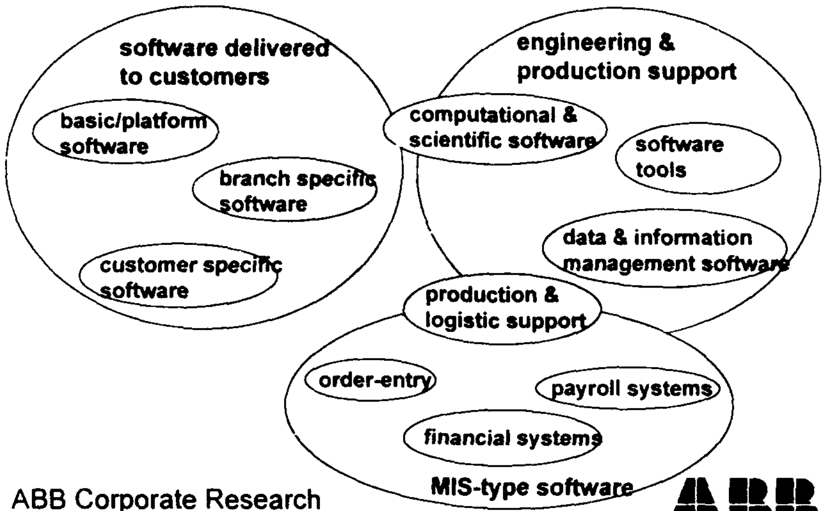
Software developed and used by ABB



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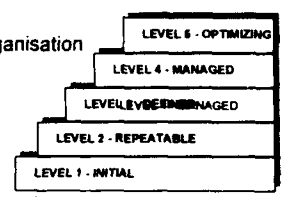
CMM Assessments at ABB

- History
  - Started in 1993 by Corporate Research Germany together with Power Plant Control
  - Questionnaire/process refined in cooperation between research centers
  - Questionnaires for levels 2, 3 and 4 exist
  - Since then more than 30 assessments performed
- Process
  - 1-hour introduction for all SW developers of an organisation
  - half-day interviews with 2-3 senior members of development groups/projects
  - half-day interview with manager
  - 2 weeks to summarize results and recommend improvement activities
  - 1-hour summary presentation plus kick-off for SPI work



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From CMM to SPI

- After a CMM assessment ...
  - Initiation of SPI activities
  - Software development managers supportive
- When customer projects run late ...
  - Senior management gives SPI lower priority
  - SPI activities are "postponed" (often means abandoned)
- What is needed ...
  - Convince management top-down
  - Initiate activities with the right incentives and resources

Vision – Skills – Incentives – Resources – Action Plan ⇒ Success

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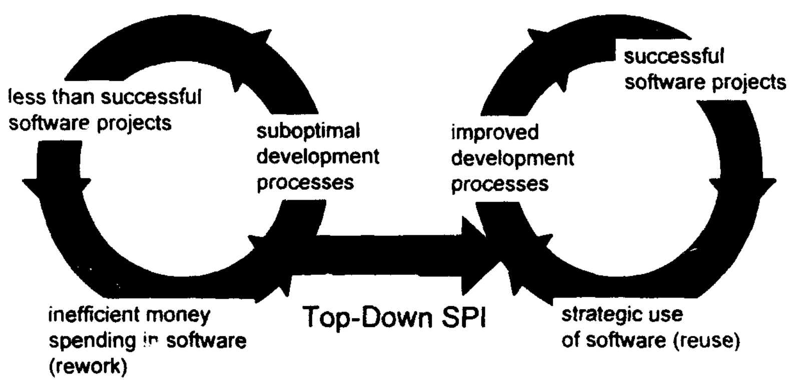
The Need for Top-Down SPI



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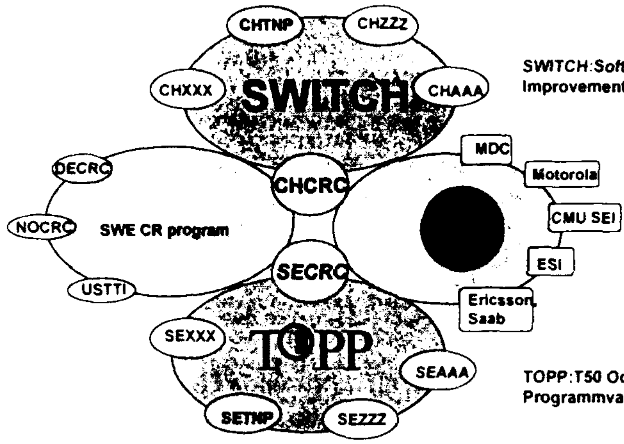
Country-Driven SPI Activities



SWITCH:SoftWare process Improvement Thrust for CH

TOPP:T50 Och Programmvaru Processen

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ABB

T50 Och Programvaru-Processen

TOPP

50 % yearly improvement

Quality
- in process
- post delivery

Timeliness

Lead time

Each company identifies own specific objectives

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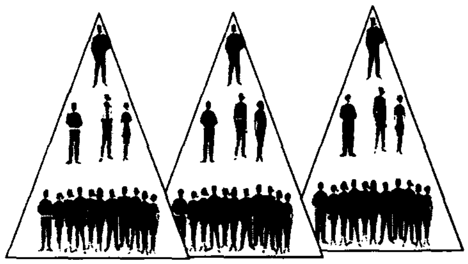
TOPP organisation

TOPP



3 people central
TOPP groupp

- Management consultants
- Corporate Research
- Rotating company representative

19 companies
Contact person at each company

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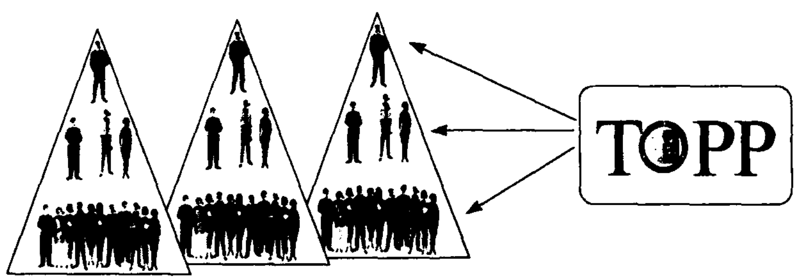
Target audience for TOPP



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TOPP planning

- Vision: ABB has world class software development in 2000
- Work backwards from vision to objectives and activities 99, 98, 97
- Objectives and activities for process, technology, competency (people) and communication/acceptence
- The TOPP 4 - companies with maturer software processes commited to being role models
- Support interests of all TOPP companies

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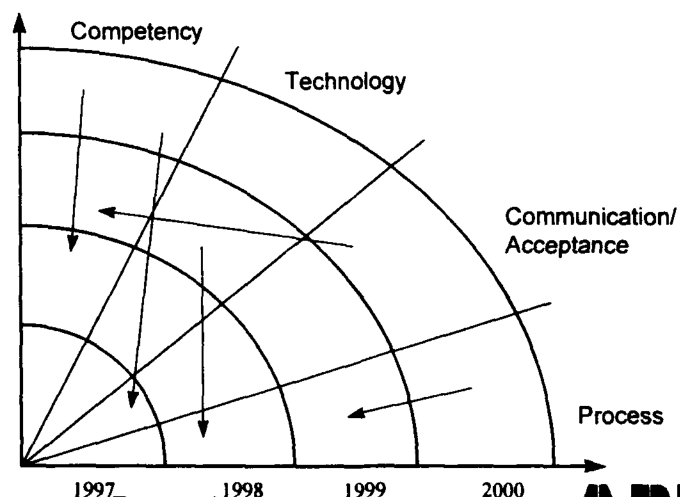
Planning Tool



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TOPP Activities 1997

- Top management informed
- Software processes understood
- TOPP 4 have improvement data
- All TOPP companies have a metrics program
- P-CMM used by at least one of the TOPP 4
- Competency profiles defined
- Training available
- Survey of development tools and environments
- Discussion database and WEB-pages

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SWITCH: SoftWare process Improvement Thrust for CH

- Getting management interest
  - Early 96: presentation to member of executive board
  - Summer 96: data collection to show importance of software development
  - Presentation of results to "cross-company team technology" responsible for technology coordination
  - Autumn 96: proposal to and decision by executive board
- Getting SWITCH off the ground
  - December 96: Kick-off seminar with one representative of each company
  - January 97: Decisions by companies to participate, responsible people named
  - March 97: All companies have improvement programs in place
  - End of 97: First reevaluation of activities → continuation decision

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Goals of SWITCH

- Cor /-specific activities, e.g.
  - Improved software development processes
  - Improved project planning and tracking (effort, schedules)
  - Improved quality assurance
  - Introduction of metrics
- Swiss activities
  - Foster and support company-specific activities
  - Keep management attention and support
  - Experience sharing between companies
  - Exchange of checklists, templates, process descriptions, ...
  - Common seminars, courses, ...

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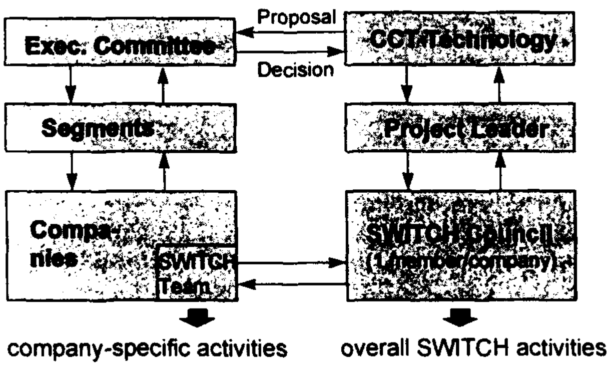
SWITCH Implementation Structure



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TOPP and SWITCH

Similarities

Driven by Corporate Research

Supported by member of country management board

Software not considered main business

Necessity of using local language

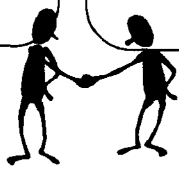
Differences

No. of people impacted

Age of initiative

Level of country wide cooperation

Degree of openess to new ideas and central initiatives



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Lessons learnt

Easy to say yes - difficult to get real commitment

Patience and perserverance

Management of expectations

Need of stable point, despite organizational or personal change

Cooperation and open exchange of information, not competition

Allow for different implementations, with same high level goals

Business needs must drive SPI, not CMM

Use advanced parts of organisation to pull others along

ABB Corporate Research
EuroSEPG/97-06-18/22

Software Engineering Institute

The Capability Maturity Model for Software, Version 2

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Bill Peterson

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Pittsburgh, PA 15213

This work is sponsored by the U.S. Department of Defense.

1

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Topics

Change – Going to Version 2 of the Software CMM

Using Templates

The Level 2 Key Process Areas

The Level 3 Key Process Areas

The Level 4 and 5 Key Process Areas

Conclusion

2

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Drivers for SW-CMM v2

Address change requests from users

Continual improvement of the SW-CMM
- **respond to growing/changing needs**
- **improved understanding of "best practices"**
- **improved understanding of levels 4 and 5**
- **make the implicit explicit**

Harmonize with relevant national and international standards (and other CMMs)
- **provide mappings**
- **minimize unnecessary differences**

3

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CMM Integration

Common CMM Framework (CCF) document set planned for release in August 1997.

Software CMM v2 is an "early adopter" of CMM Integration criteria.
- **piloting CMM Integration proposals as part of the v2 effort**
- **v2 will satisfy CCF requirements**
- **reassignment of resources significantly impacted Software CMM schedule**

4

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Global Changes

The name of level 4 will be changed from "Managed" to "Quantitatively Managed."

Key practices will be rewritten in active voice.

Templates will be used systematically.

- templates provide consistency and highlight exceptions

5

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Key Process Area Changes

Software Supplier Management at level 2

- major revision of Software Subcontract Management

Software Risk Management at level 3

- draft key process area released for review
- final decision on incorporation will be made in May

Significant revision of levels 4 and 5

6

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Other Significant Changes

Focused Integrated Software Management on differences from Software Project Planning and Software Project Tracking & Oversight rather than similarities.

Expanded scope of Software Product Engineering on both ends of life cycle.

- requirements elicitation and systems analysis
- delivery and installation
- operations
- support
- maintenance

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Revise Goals

Goals are primary SW-CMM rating components.

- need to capture institutionalization explicitly in rating

Systematically revise goals to incorporate maturity level principles.

- institutionalization embedded in definitions of maturity level principles
- implies replacing current "planning" goals

8

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Systematic Key Practice Changes

Plan moved from Activity to Ability.

Training and orientation key practices combined.

Measurement key practices reworded to focus on use for control and improvement.

Review and/or audit key practices split into process assurance and product assurance.
- **audit terminology removed**

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Rejected Proposals

Many proposed major changes, i.e., add a key process area, will be implemented as minor changes.
- **key practices**
- **subpractices**
- **examples**

Examples include:
- **test management**
- **requirements elicitation**
- **packaging, delivery, installation, operations**
- **maintenance**

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Topics

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Templates

Express common concepts using common terminology.

Especially true for the "institutionalization" key practices (i.e., Commitment, Ability, Measurement, Verification).

Some templates need to change at different maturity levels to capture maturity principles accurately.

12

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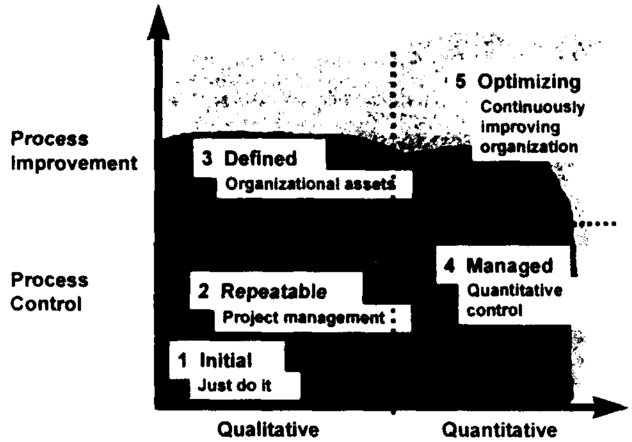
Maturity Level Principles: Organizational Capability



13

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Initial Level

Maturity level 1 implies software engineering and management processes are performed in an ad hoc manner.

No further description of maturity level 1 is necessary.

- **broad range of engineering and management practices possible**
- **consistency across time and across the software organization problematic**

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Repeatable Level

Emphasis is on qualitative process control by applying basic project management.

In SW-CMM v1, we used "according to a documented procedure" at level 2 (and higher).

"Perform {KPA} according to a *repeatable* process."

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Defined Level

Emphasis is on qualitative process improvement by organizational learning.

- **build on concept of "repeatable process"**

In SW-CMM v1, we used "according to a defined process" sporadically, beginning at level 3.

Perform {KPA} according to a *defined process.*

Perform {KPA} according to the *project's defined software process.*

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Software Engineering Institute

Quantitatively Managed Level

Emphasis is on quantitative process control by the systematic use of measurement.

- **build on concept of "defined process"**
- **implies management by fact, predictability**

"Perform {KPA} to support *quantitatively managed processes.*"

17

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Optimizing Level

Emphasis is on continual process improvement based on a quantitative understanding of the implications of process change.

- **build on concept of quantitatively managed process**

"Perform {KPA} to support *optimizing processes.*"

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Institutionalization Goals

Institutionalization is at least as important as implementation for building process maturity and capability.

V2 will have an "institutionalization goal" for each key process area.

- **capture the principle of the maturity level concisely**
- **map all of the institutionalization practices (i.e., Commitment, Ability, Measurement, Verification)**
- **explicitly and separably capture institutionalization as a rating component**

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Commitment to Perform

Describes the actions the organization must take to ensure that the process is established and will endure

Typically includes

- **policy**
- **sponsorship *(for organization KPAs)***

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Ability to Perform

Describes the preconditions that must exist in the project or organization to implement the software process competently

Typically includes
- **plan**
- **resources and funding**
- **responsibility and authority**
- **training**

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Activities Performed

Describes the roles and procedures necessary to implement a key process area

Implement the institutionalized process

Subpractice templates for
- **configuration management**
- **reviews**
- **peer reviews**
- **etc.**

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Measurement and Analysis

Describes the need to measure the process and analyze the measurements

Typically includes

- **control**
- **improvement**

(level 3 and higher)

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Verifying Implementation

Describes the steps to ensure that the activities are performed in compliance with the process that has been established

Typically includes

- **process assurance**
- **product assurance**
- **project manager review**
- **senior management review**

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Topics

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Conclusion

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Requirements Management (RM)

The purpose of Requirements Management is to establish a common understanding between the customer and the software project of the customer's requirements that will be addressed by the software project.

Interface between software project and "customer" is fuzzy.

- *systems engineering*
- *marketing*
- *external customer*

Important that allocated requirements be documented and controlled.

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Software Project Planning (PP, SPP)

The purpose of Software Project Planning is to establish reasonable plans for building the software product and for managing the software project.

"Plan the plan" was a controversial template to apply.

- ***concept is valid, although may be out of scope***

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Software Project Tracking and Oversight (PT, PTO)

The purpose of Software Project Tracking and Oversight is to provide adequate visibility into actual progress so that management can take effective actions when the software project's performance deviates significantly from that planned.

Key practices changed to make PTO more consistent with SPP.

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Software Supplier Management (SM, SSM)

The purpose of Software Supplier Management is to effectively manage the acquisition of software obtained externally to the software project.

Major expansion of v1.1's Software Subcontract Management KPA to include non-developmental software included in product
- ***commercial-off-the-shelf software***
- ***customer-supplied software***

Tools in software engineering environment is considered a risk rather than in scope of this key process area.

Software Quality Assurance (QA, SQA)

The purpose of Software Quality Assurance (SQA) is to ensure that the software project's activities and work products comply with the applicable requirements, process descriptions, standards, and procedures.

Lowered the visibility of the SQA group.
- ***alternative implementations in some organizations***

Separated process and product assurance
- ***SQA goals***
- ***Verification practices***

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Software Configuration Management (CM, SCM)

The purpose of Software Configuration Management (SCM) is to establish and maintain the integrity of the products of the software project throughout the software life cycle.

Terminology remains a challenge.

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Topics

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The Level 4 and 5 Key Process Areas

Conclusion

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Maturity Level 3 Issues

Using "defined process" versus "project's defined software process"

Distinguish between level 3 concepts and level 2 concepts (particularly in Integrated Software Management)

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Organization Process Focus (PF, OPF)

The purpose of Organization Process Focus is to establish and maintain an understanding of the organization's software processes and coordinate the organization's software process improvement activities.

Should the focus be "software process management" or "software process improvement?"

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Organization Process Definition (PD, OPD)

The purpose of Organization Process Definition is to establish and maintain a usable set of software process assets that improve process performance across the organization, and provide a basis for cumulative, long-term benefits to the organization.

Set of standard software processes for organization

Changed "organization's software process database" to "organization's software measurement database."

- ***placed under change control***

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Organization Training Program (TP, OTP)

The purpose of the Organization Training Program key process area is to develop the skills and knowledge of individuals so they can perform their software roles effectively and efficiently.

Re-focused on organizational training perspective.

Name change to include "Organization" also applies to other key process areas at higher levels.

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Integrated Software Management (IM, ISM)

The purpose of Integrated Software Management is to integrate the software engineering and management activities into a coherent, defined software process that is tailored from the organization's standard software process family, which is described in the Organization Process Definition key process area.

Revised to focus on level 3 nature of planning and managing software projects.

- ***emphasize differences with level 2 rather than similarities***

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Software Product Engineering (PE, SPE)

The purpose of Software Product Engineering is to consistently perform a well-defined engineering process that integrates all the software engineering technical activities to produce correct, consistent software products effectively and efficiently.

"Software engineering" includes management practices; "software product engineering" is jargon...

Expanded to capture overall life cycle.

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Intergroup Coordination (IC)

The purpose of Intergroup Coordination is to actively participate with the other groups involved in the software project to address the system-level and intergroup aspects of the project in order to better satisfy the customer's needs.

Still has bias towards "groups" that we've tried to remove or demote elsewhere.

- ***renaming as "Collaborative Work" proposed***

Still written from software perspective.

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Peer Reviews (PR)

The purpose of Peer Reviews is to remove defects from the software work products early and efficiently. An important corollary is to develop a better understanding of the software work products and of defects that might be prevented.

New goal: "Establish a shared understanding of the software work products through participation in peer reviews."

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Software Risk Management (SR, SRM)

The purpose of Software Risk Management is to identify and mitigate software risks throughout the life cycle of a software product.

The most controversial proposal in Draft A...

If adopted, the risk management goals and key practices in ISM will be deleted.

Decision will be made in May at joint CMM Advisory Board/Software CMM Change Control Board meeting.

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Topics

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The Level 4 and 5 Key Process Areas

Conclusion

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In Process...

Maturity levels 4 and 5 are still under development.

- **key process area names will change!**

Using the templates consistently and meaningfully at levels 4 and 5 is challenging.

- **for example, "Perform quantitative process management according to a quantitatively managed process."**

The level 4 and 5 key process areas will be distributed in Draft B'.

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Clarify Level 4

Major focus is clarifying the rigorous and systematic use of statistics at level 4.

- **quantitative management is more than just measurement**
- **understanding what data means – what to control and what not to control**

Proposed level 4 key process areas

- **Statistical Process Management**
- **Organization Process Performance**
- **Organization Product Alignment**

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Build on Quantitative Understanding of Process

Need to communicate that level 5 builds on level 4 capability.

- **concepts of measurable improvement, agility, innovation poorly expressed**

Proposed level 5 key process areas

- **Incremental Improvement**
- **Innovative Improvement**
- **Process Opportunity Analysis**
- **Participative Deployment**

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Topics

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Conclusion

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Drafts

Draft A is now available for review and pilot testing.
- level 2 and 3 key process areas

Draft B will contain the level 4 and 5 key process areas.
- two separate releases: B' and B
- selected front matter and appendices
- incorporate draft CMM integration criteria

Draft C will be the "final draft."
- additional drafts may be necessary, depending on feedback received

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For Additional Information

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Web page
http://www.sei.cmu.edu/technology/cmm

48

ESPI - European SEPG

Using SPI Principles to Improve the Value of Legacy Systems

Bank of America, UK
Global Systems Development

"Legacy" Systems

Does "Legacy" mean anything? Example:

"JavaStations are designed to coexist with legacy desktop applications"

Does "Heritage" mean anything?

Systems as humanity!

We spend most of our life cycle in a stage called "Maturity"

Systems spend most of theirs in a stage called "Maintenance"

"Legacy" is a stage of the maintenance cycle

What are the Classes of Maintenance?

- **Perfective**
  - **Enhancements to meet changing business requirements or functions; business-driven**
- **Adaptive**
  - **Upgrades to meet changing technical requirements or functions; technology-driven**
- **Preventative**
  - **Improving quality, reliability, maintainability and preventing errors from occurring; a proactive process**
- **Corrective**
  - **Fault diagnosis and correction; a reactive process**

Within these classes we have choices

- Perfective
- Adaptive
- Preventative
- Corrective

- Discretionary
  - Prioritised business enhancements
  - A new operating system feature
  - The Millennium
  - Minor irritating problems
- Non-discretionary
  - Regulatory
  - Audit/compliance
  - External agencies
  - Head Office needs

It will help focus your management of maintenance, and thus "legacy", if you can construct your plans to reflect these classes

Ten Ticklist Topics

- System is subject to active perfective maintenance
- Majority of perfective maintenance is discretionary
- System is subject to active adaptive maintenance
- Majority of adaptive maintenance is discretionary
- System is subject to active preventative maintenance
- Development productivity improving
- Internal quality improving
- Simple integration with other technologies
- Reuse at least 30%
- Active market in development skills

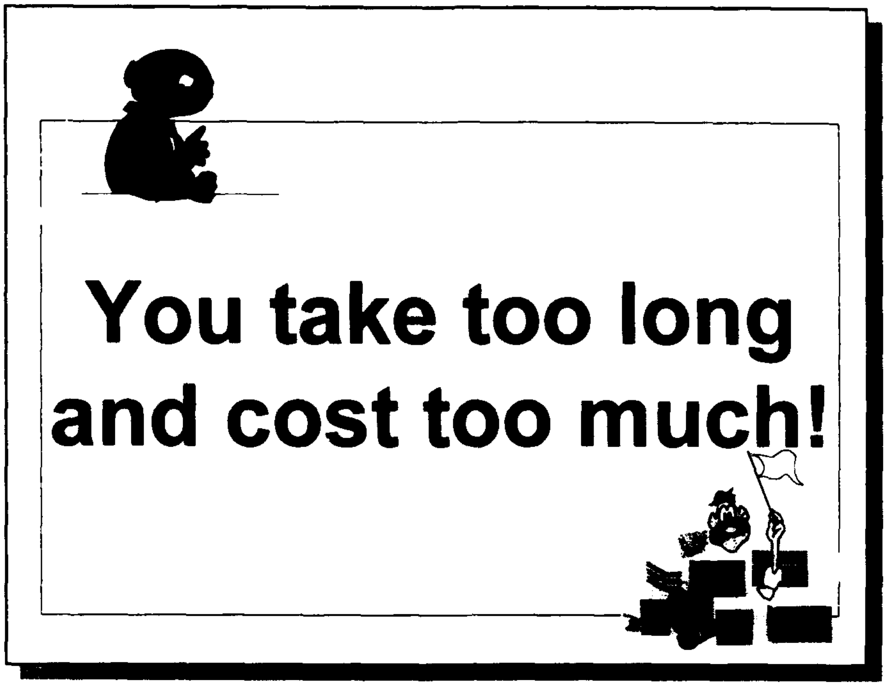
Against how many of these can you place a tick?

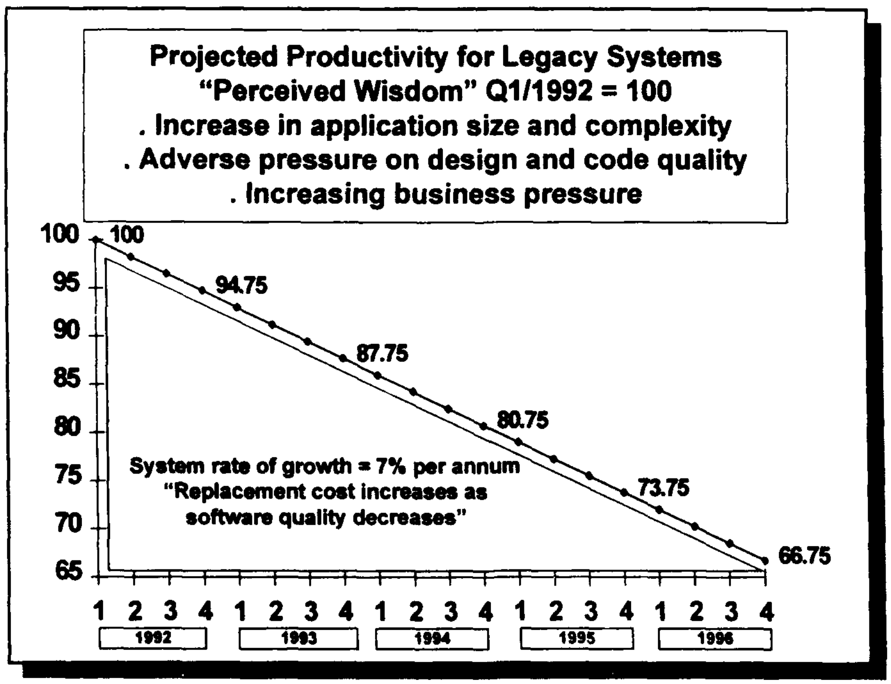
The Four Stages of Maintenance

- **Endowment: tick 10 - 8**
- **Heritage: tick 7 - 5**
- **Legacy: tick 4 - 2**
- **Liability tick 1 - 0**

- **Longer, and better quality, life cycle with higher maintenance investment; systems which are:-**
- **Strategic, long-term business operations**
- **Critical business functions**
- **Subject to rapid technology evolution**

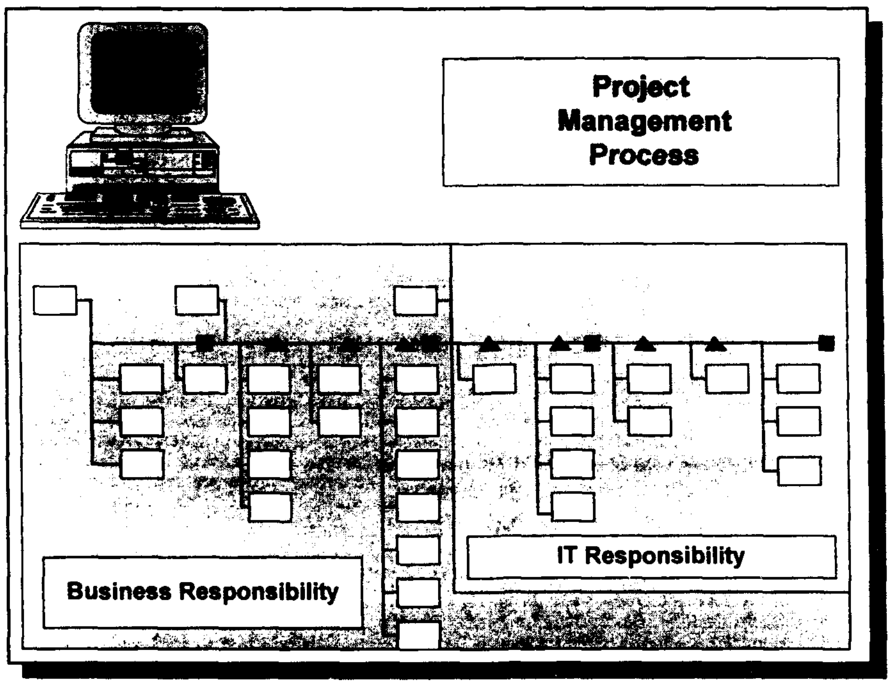
Any questions?

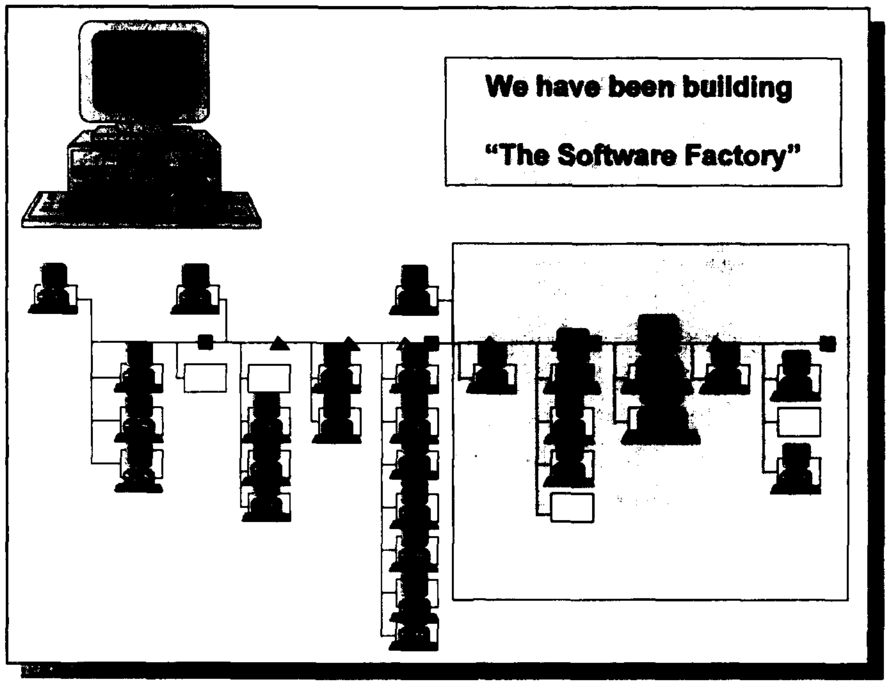

You take too long
and cost too much!


Projected Productivity for Legacy Systems
"Perceived Wisdom" Q1/1992 = 100
. Increase in application size and complexity
. Adverse pressure on design and code quality
. Increasing business pressure
100
95
90
85
80
75
70
65
100
94.75
87.75
80.75
73.75
66.75
System rate of growth = 7% per annum
"Replacement cost increases as
software quality decreases"
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
1992
1993
1994
1995
1996

Strategy Decision - 1990 - SPI
Process, Product and People Improvement

- **Establish measures, publish to IT and business**
- **Improve software quality**
- **Declare the mainframe development environment "Legacy"**
- **Invest in new development technologies**
- **Endow the GBS/IMS system through into the new millennium**
- **Ensure millennium compliance**
- **Evolve the ability to integrate with emerging and converging technologies**





Global Banking System
Some general information

- IMS/TM
- Some 25,000 "components"
- 6,000 COBOL components
- 1,600 ADF components
- 110+ physical databases; 250+ db datasets
- Across each of 10 IMS "hosts"
- 40 countries supported
- "The sun never sets"; 7-day x 24-hour
- 15-17,000 changes per year; 70 projects
- Consolidated change every month
- Developer population c. 40

Development Environment Mainframe - VM/ISPF Clients, VM and MVS Servers

- Productive platform, but: plenty of text editing
- No ability to integrate workstation tools
- A large list of required enhancements
- Sound basic client/server architecture
- Classified as "Legacy"

Development Environment "The New" is:- Developer 2000

- The COBOL quality programme
- Developer 2000
  - Developer LAN
  - Simple application population
  - Complex application population
- ADF migration
  - Developer Dialogue

Development architecture The "Software Factory"

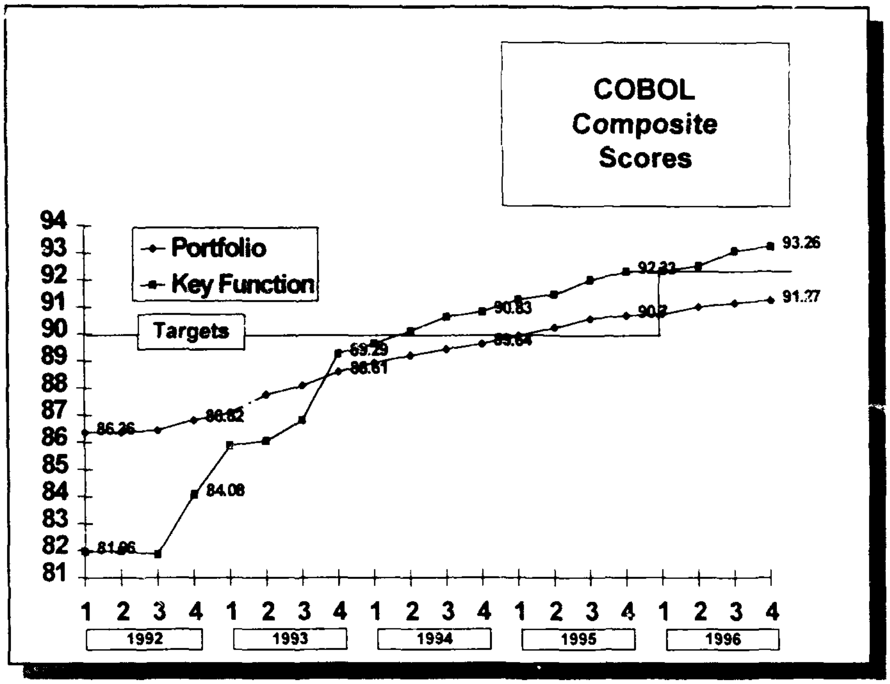
Workstation services	LAN services	Mainframe services	
OS/2	Token ring/Novell	VM	MVS
3270 emulation	Netware for SAA	GPPA	GPPA
	[illegible]	[illegible]	[illegible] Legacy
Source [illegible]		[illegible]	Source library
Developer Dialogue	On-line txn library	[illegible]	[illegible]
Module re-engineering			Appl Knldge Repos
COBOL Workbench	GBS LAN executables		MVS executables
Unit testing	Test Manager		Integration testing
Local file handling			TSO tools
	DBD/PSB library	Ctl block transfer	DBD/PSB libs
Test data (update)	Test data (read)	Data transfer	Test data (update)
Impact analysis	LAN Workbench	Impact analysis	LIBRARIAN
Office automation	Message Manager	Mail WAN	
Project control	Project Repository		
Reference manuals	BookManager		

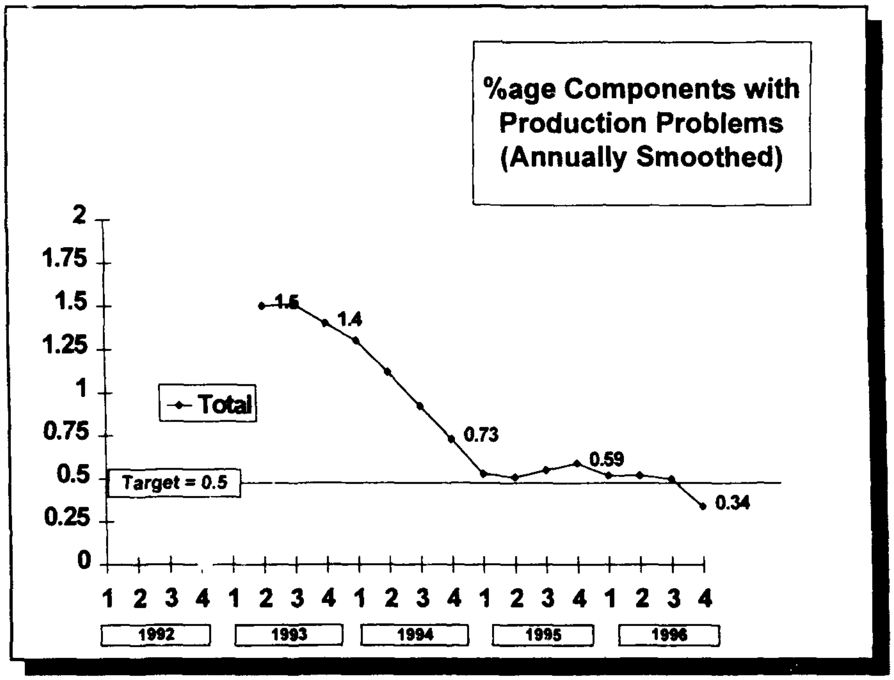
Any questions?

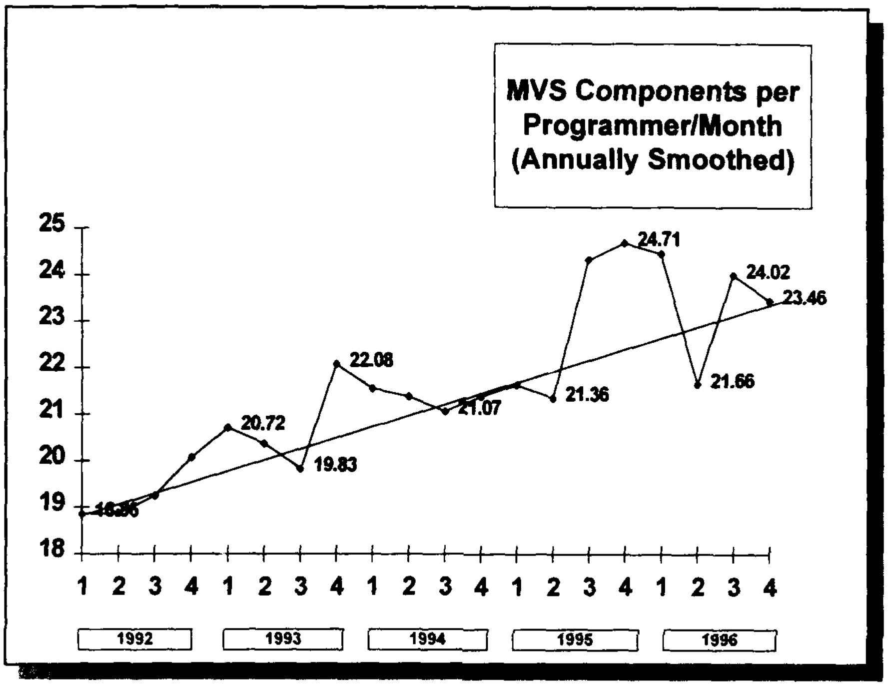
Global Systems Development Key Performance Measures

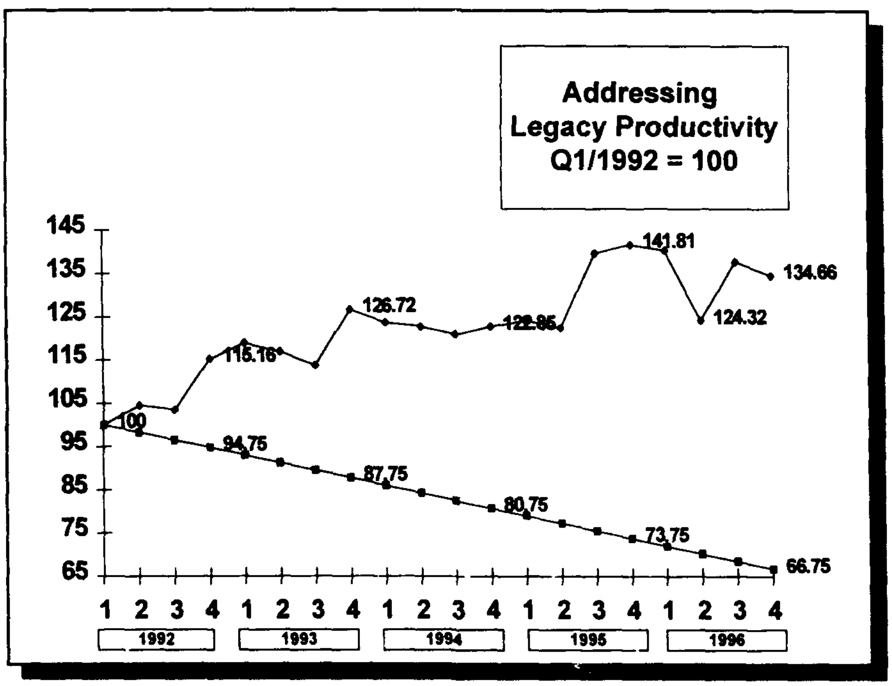
Key Performance Measures What is a "component"?

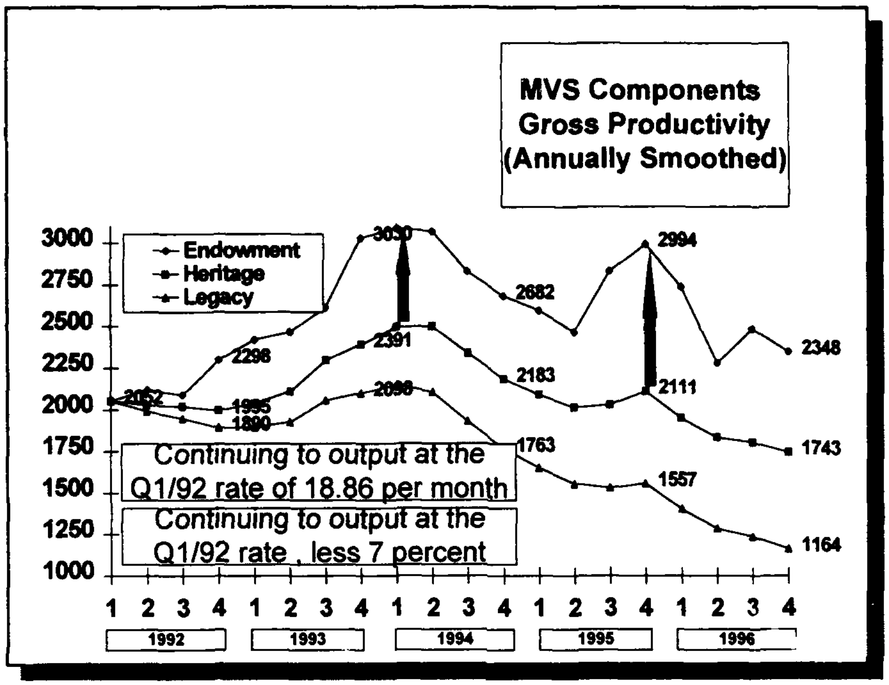
- **It is a piece of GBS which passes through the Production Release System, where it can be counted, as we do a release each month.**
- **It is a basic building block which everybody understands, and which has remained constant over time, e.g:-**
  - A COBOL module
    - » COBOL COPYbooks
  - An ADF transaction
    - » ADF dynamic rules
    - » ADF Special Processing Routines
  - A JOB
    - » A PROCedure


COBOL
Composite
Scores
Portfolio
Key Function
Targets
94
93
92
91
90
89
88
87
86
85
84
83
82
81
86.26
86.82
84.08
81.66
89.29
88.61
90.83
89.64
92.32
90.7
93.26
91.77
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
1992
1993
1994
1995
1996

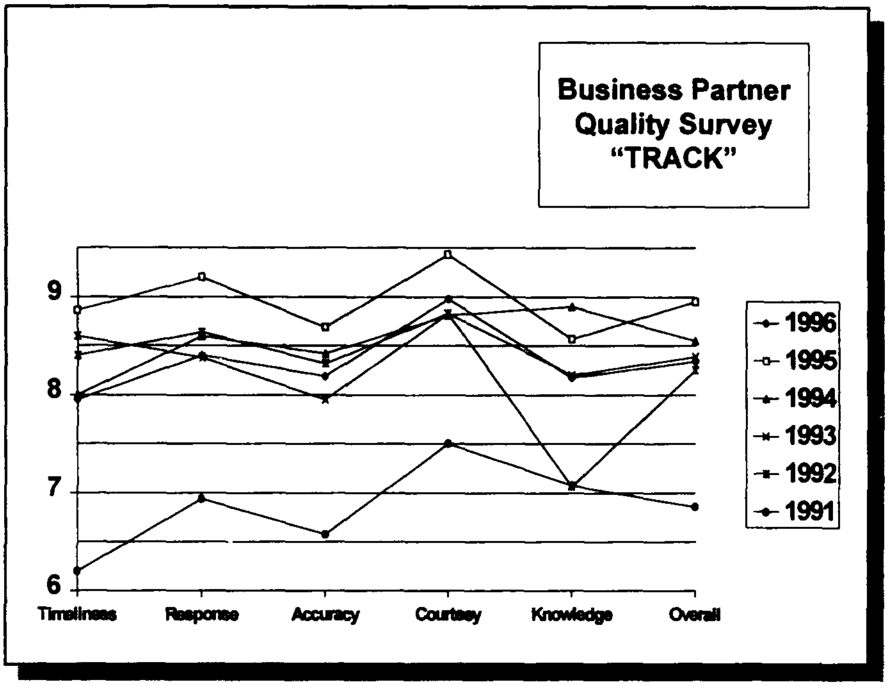

%age Components with
Production Problems
(Annually Smoothed)
Total
Target = 0.5
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
1.5
1.4
0.73
0.59
0.34
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
1992
1993
1994
1995
1996

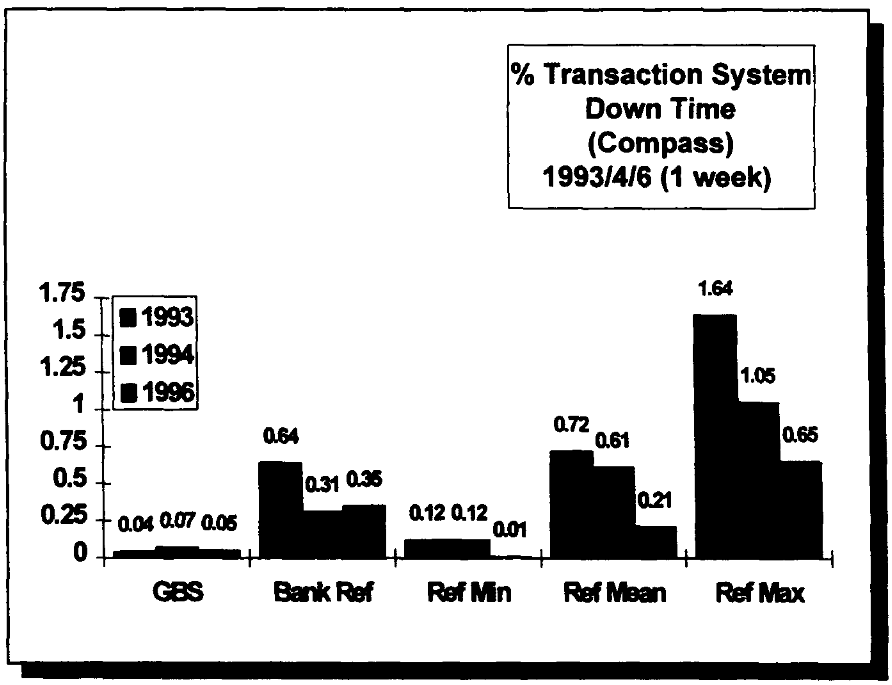

MVS Components per Programmer/Month (Annually Smoothed)
25
24
23
22
21
20
19
18
24.71
24.02
23.46
22.08
21.36
21.66
21.07
20.72
19.83
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
1992
1993
1994
1995
1996

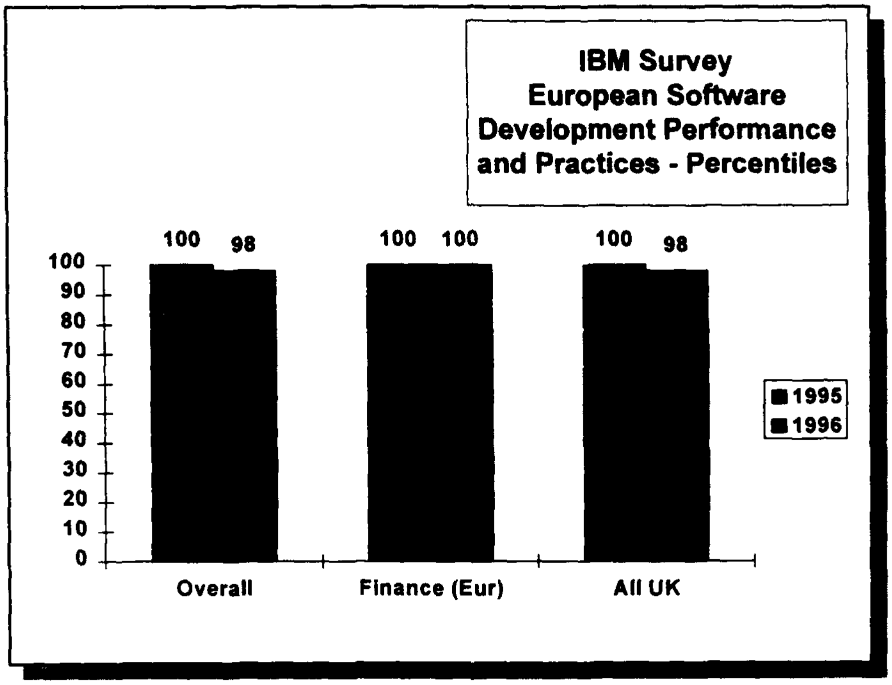

Addressing Legacy Productivity Q1/1992 = 100
145
135
125
115
105
95
85
75
65
141.81
134.66
126.72
124.32
115.16
100
94.75
87.75
80.75
73.75
66.75
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
1992
1993
1994
1995
1996

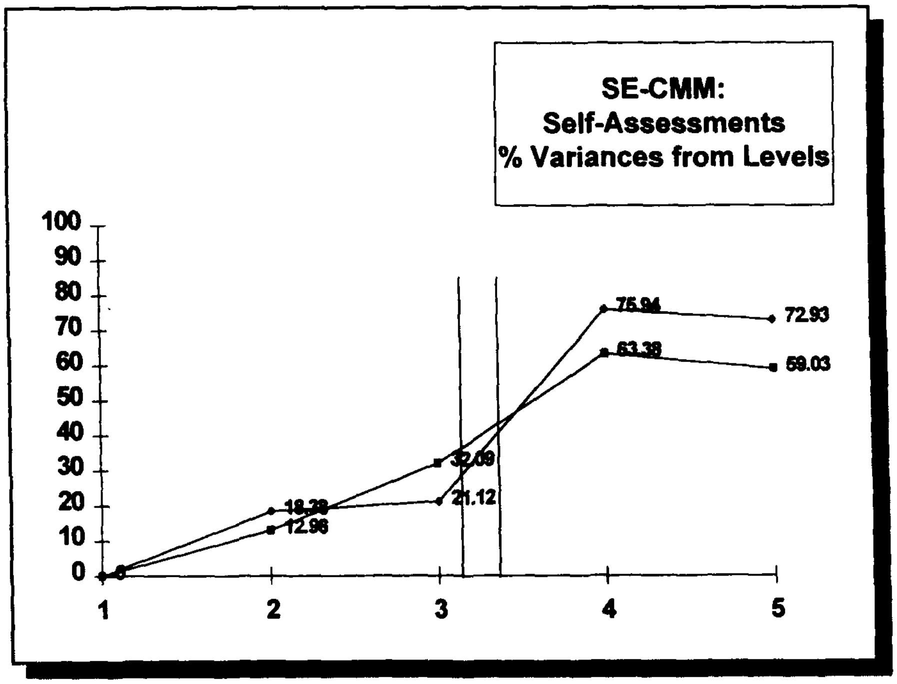

MVS Components
Gross Productivity
(Annually Smoothed)
Endowment
Heritage
Legacy
3000
2750
2500
2250
2000
1750
1500
1250
1000
3030
2994
2682
2348
2298
2391
2183
2111
1743
2052
1995
1890
2098
1763
1557
1164
Continuing to output at the
Q1/92 rate of 18.86 per month
Continuing to output at the
Q1/92 rate , less 7 percent
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
1992
1993
1994
1995
1996


Any questions?
(Internal Measures!)


Business Partner Quality Survey "TRACK"
9
8
7
6
Timeliness
Response
Accuracy
Courtesy
Knowledge
Overall
1996
1995
1994
1993
1992
1991

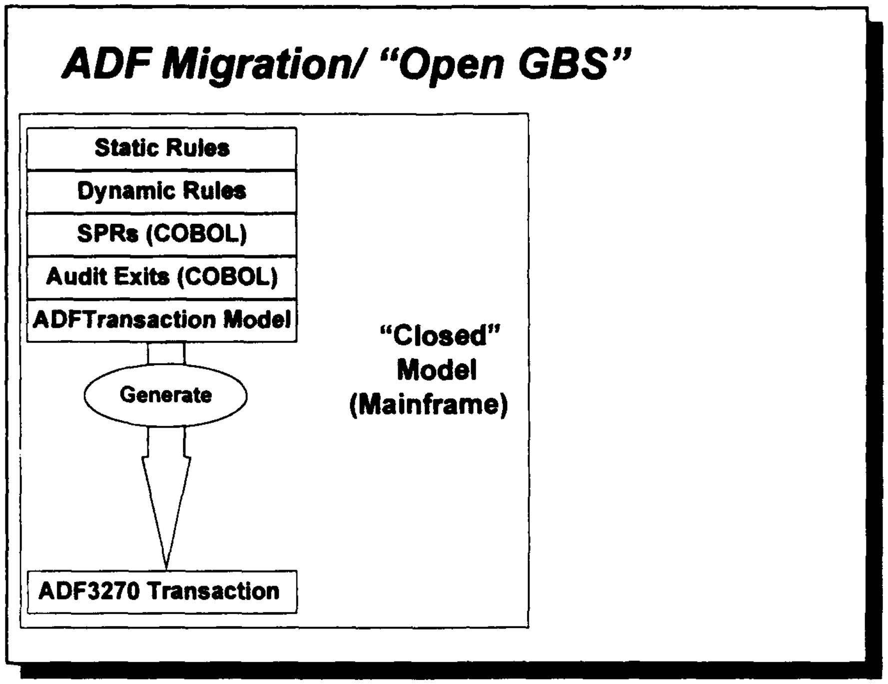

% Transaction System Down Time (Compass) 1993/4/6 (1 week)
1.75
1.5
1.25
1
0.75
0.5
0.25
0
1993
1994
1996
0.04 0.07 0.05
0.64 0.31 0.35
0.12 0.12 0.01
0.72 0.61 0.21
1.64 1.05 0.65
GBS
Bank Ref
Ref Min
Ref Mean
Ref Max

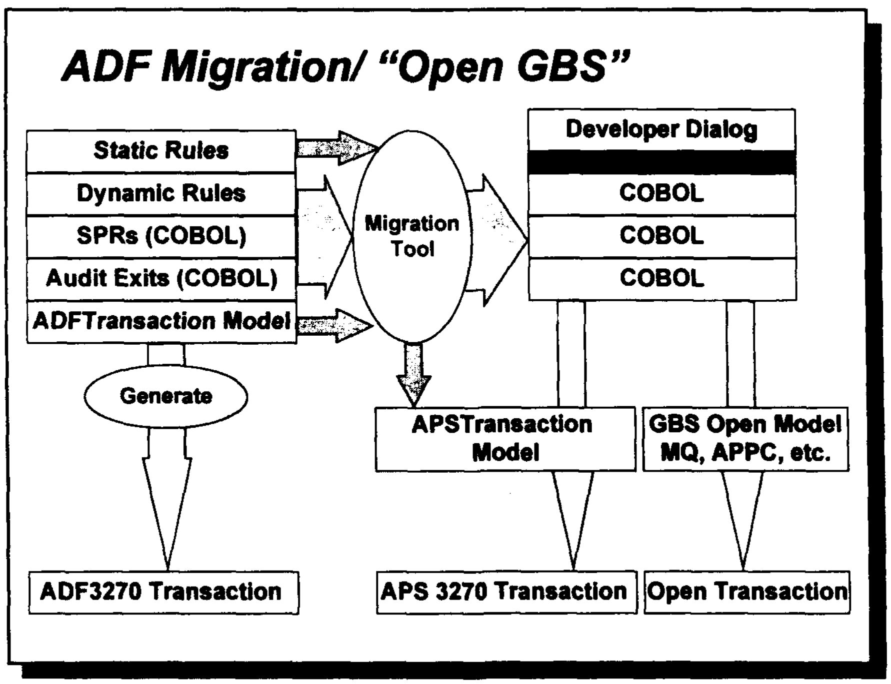

IBM Survey
European Software
Development Performance
and Practices - Percentiles
100
98
100
100
100
98
100
90
80
70
60
50
40
30
20
10
0
Overall
Finance (Eur)
All UK
1995
1996

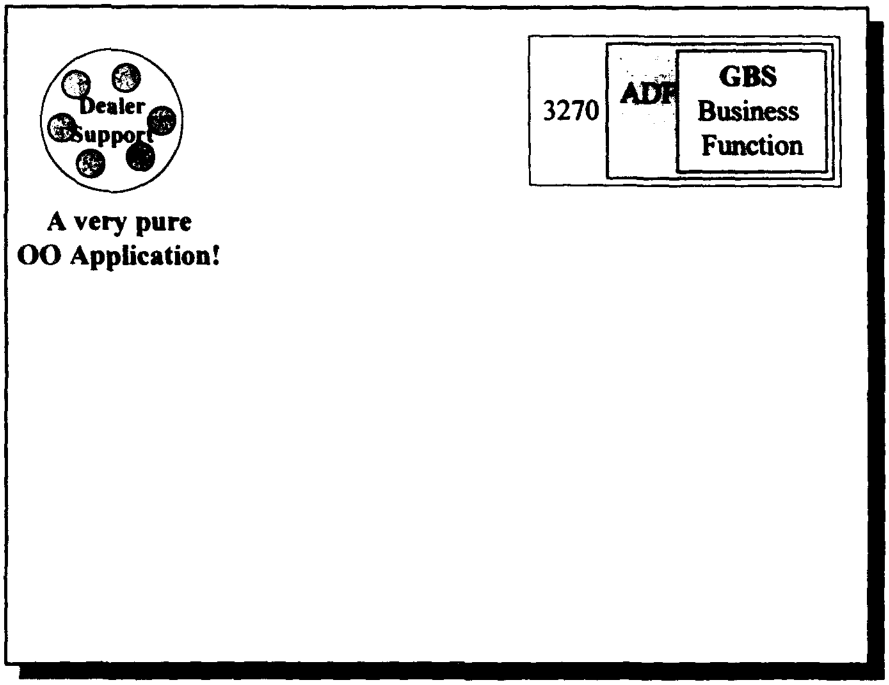

SE-CMM:
Self-Assessments
% Variances from Levels
100
90
80
70
60
50
40
30
20
10
0
18.38
12.96
32.09
21.12
75.94
72.93
63.38
59.03
1
2
3
4
5

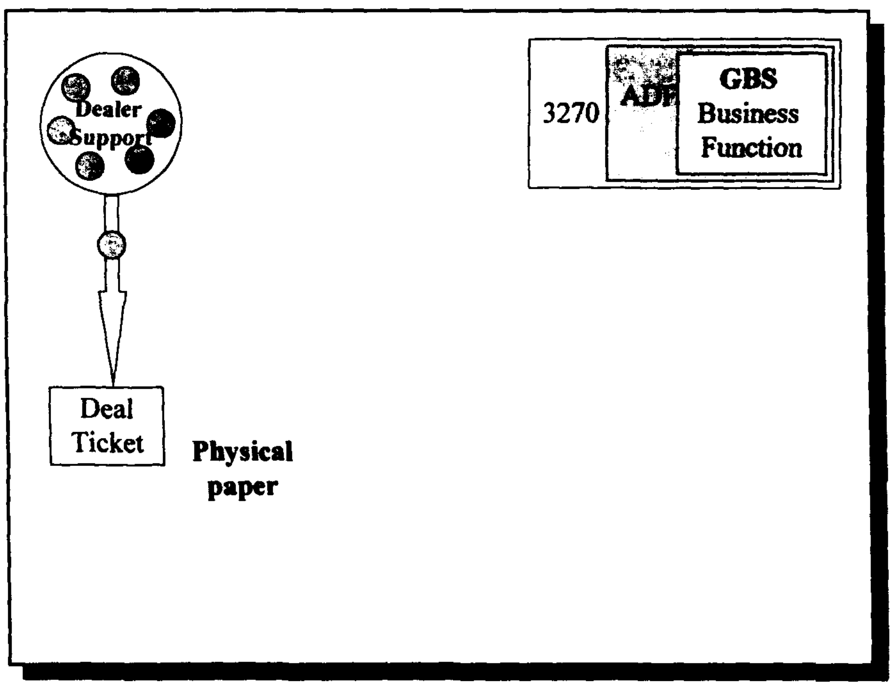
Any questions?

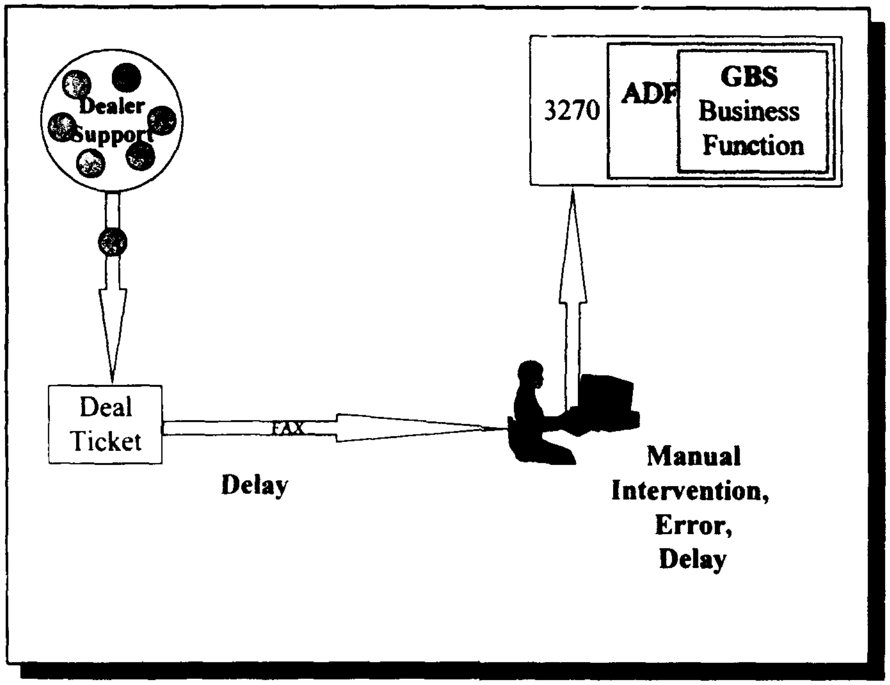
ADF (3270 Interface) Migration Wrapping "Legacy" functions

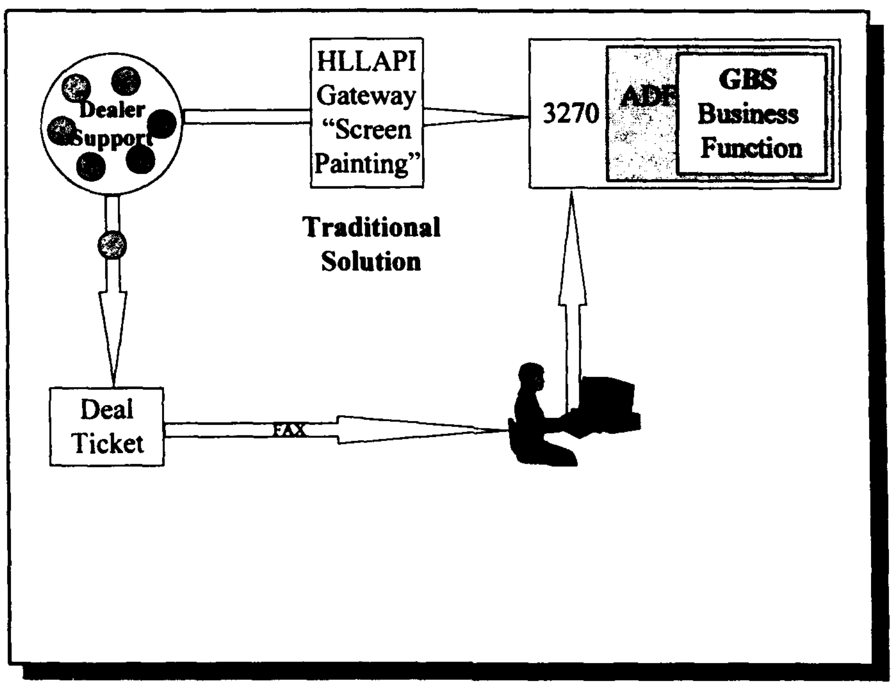

ADF Migration/ "Open GBS"
Static Rules
Dynamic Rules
SPRs (COBOL)
Audit Exits (COBOL)
ADFTransaction Model
Generate
ADF3270 Transaction
"Closed" Model (Mainframe)

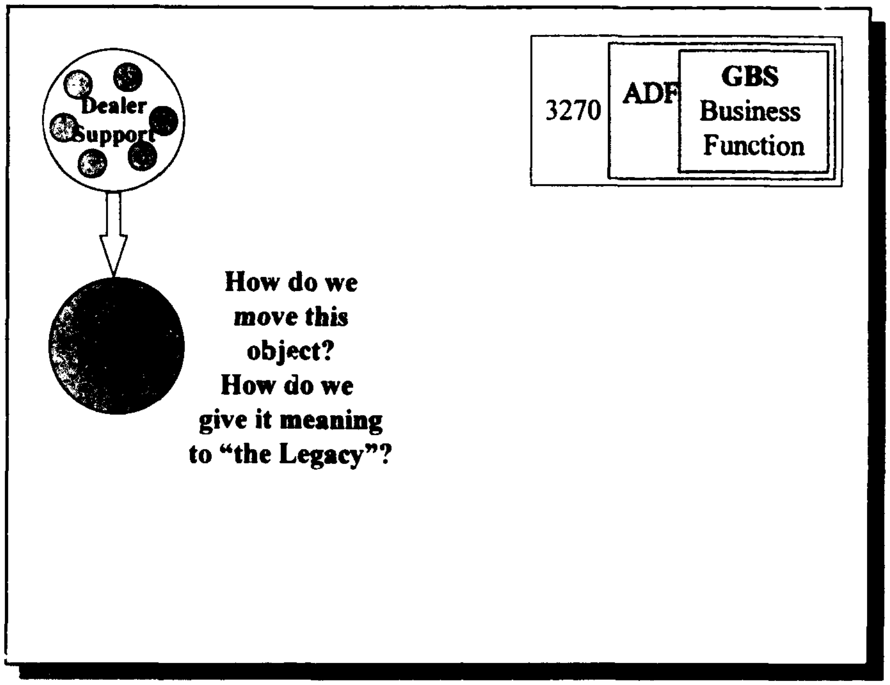

ADF Migration/ "Open GBS"
Static Rules
Dynamic Rules
SPRs (COBOL)
Audit Exits (COBOL)
ADFTransaction Model
Generate
ADF3270 Transaction
Migration Tool
Developer Dialog
COBOL
COBOL
COBOL
APSTransaction Model
GBS Open Model MQ, APPC, etc.
APS 3270 Transaction
Open Transaction

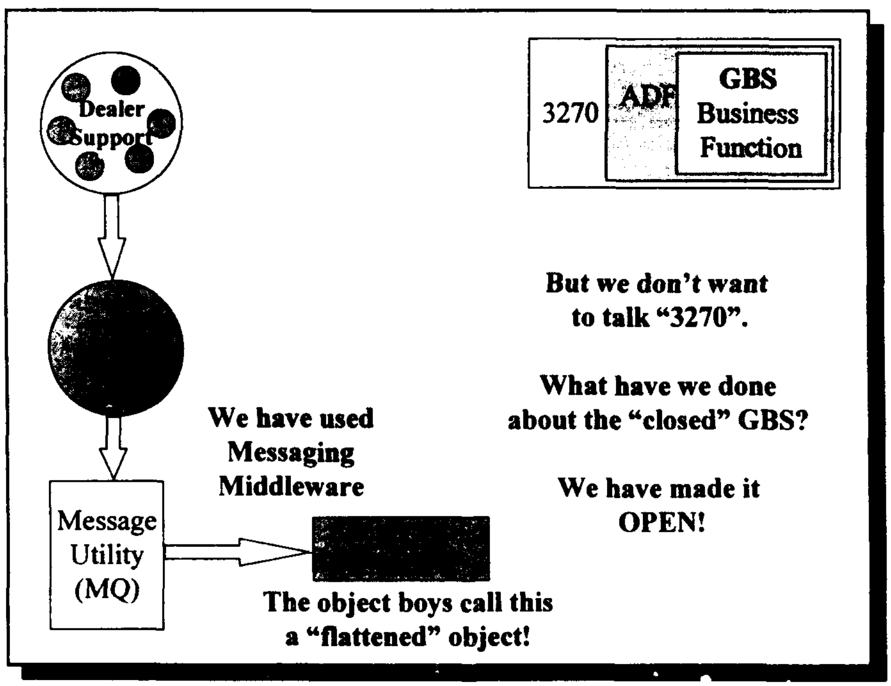

Dealer Support
A very pure OO Application!
3270
ADP
GBS Business Function

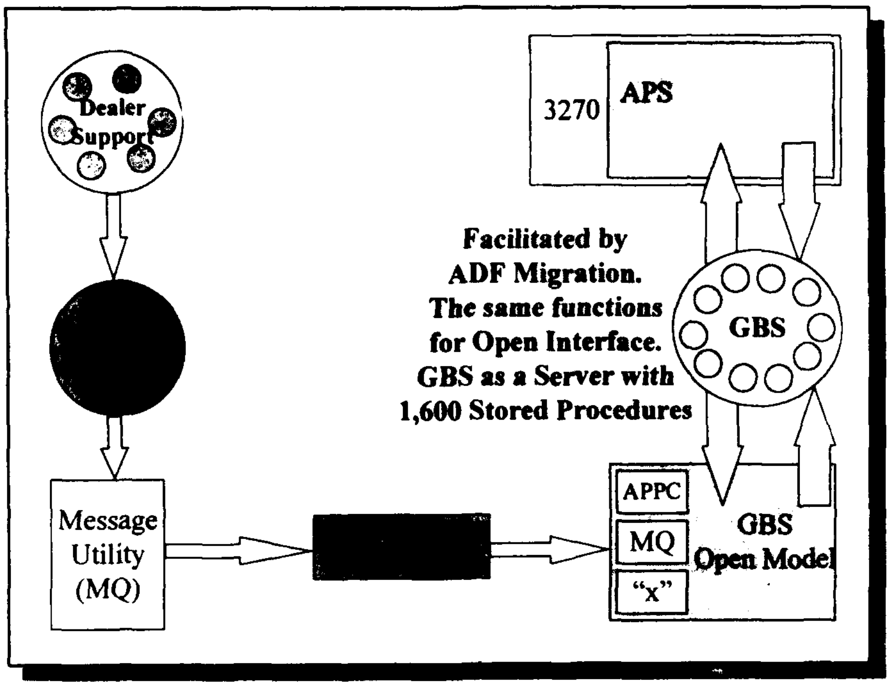

Dealer Support
Deal Ticket
Physical paper
3270
ADP
GBS Business Function

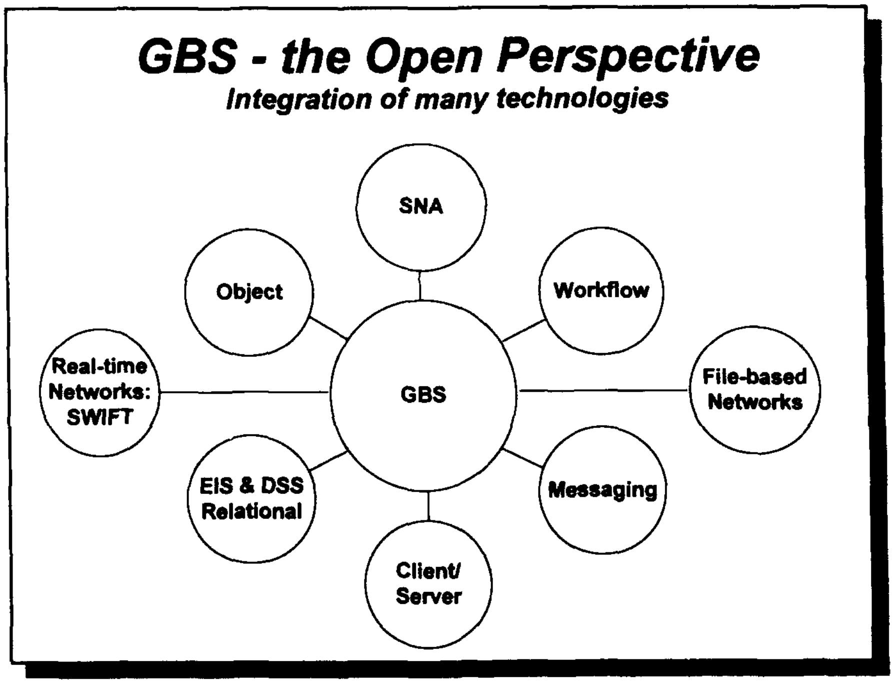

Dealer Support
3270
ADF
GBS
Business
Function
Deal
Ticket
FAX
Delay
Manual
Intervention,
Error,
Delay


Dealer Support
HLLAPI
Gateway
"Screen
Painting"
3270
ADF
GBS
Business
Function
Traditional
Solution
Deal
Ticket
FAX


Dealer Support
3270
ADF
GBS Business Function
How do we move this object? How do we give it meaning to "the Legacy"?


Dealer Support
3270
ADF
GBS Business Function
But we don't want to talk "3270".
What have we done about the "closed" GBS?
We have made it OPEN!
We have used Messaging Middleware
Message Utility (MQ)
The object boys call this a "flattened" object!


Dealer Support
[redacted]
Message Utility (MQ)
[redacted]
3270
APS
Facilitated by ADF Migration. The same functions for Open Interface. GBS as a Server with 1,600 Stored Procedures
GBS
APPC
MQ
"x"
GBS Open Model


GBS - the Open Perspective
Integration of many technologies
SNA
Object
Workflow
Real-time Networks: SWIFT
GBS
File-based Networks
EIS & DSS Relational
Messaging
Client/ Server

Final questions?

OUCH!

Experiencing Software Process Improvement at the Sharp End

Paul Hookham
Head of Project & Technical Services
Information Systems
Lloyds TSB Group

Paul Hookham, Lloyds TSB Group European SEPG, June 1997

Agenda

- Today's Objectives
- About our company
- Reasons for SPI in Lloyds / TSB
- Some Mistakes
- Good Practice
- Curved Balls
- Successes
- Blueprint - 10 Critical Success Factors
- What Next?

Paul Hookham, Lloyds TSB Group European SEPG, June 1997

Today's Objectives

TSB

- A Personal Viewpoint
- Resistance encountered
- Interesting behaviour
- What didn't work
- What worked well
- Some things to watch out for
- Why it's working now
- The Next Steps

Paul Hookham, Lloyds TSB Group European SEPG June 1997

About our company

TSB

- Provision of Financial Services
- Lloyds / TSB merged 28 December 1995
- 2,810 High Street branches
- 82,000 employees
- Group assets : £147 billion
- Top 5 UK quoted company with a market capitalisation of £33 billion (11/05/97)
- Merger benefits to be accrued
- Significant other challenges ahead

Paul Hookham, Lloyds TSB Group European SEPG June 1997

About our company

TSB

Information Systems:

- Software Development and Support
- 1,400 employees
- 9 UK sites

Paul Hookham Lloyds TSB Group European SEPG June 1997

Reasons for SPI in Lloyds / TSB

TSB

- Productivity - (Function Point per £)
- Predictability - (Function Point per month)
- Flexibility & Responsiveness - (Resource Pools)
- Demonstrate competitiveness - (Assessments)
- Improve Defect Detection & Removal Rate - (Inspection)
- Improve Benchmark position - (Credibility)
- Focus on the Quality System

Paul Hookham Lloyds TSB Group European SEPG June 1997

Some Mistakes

TSB

- Lack of skilled resource
- Tick in the box mentality
- Lack of ownership
- Inadequate training / awareness
- Too concerned about Business Case
- Too concerned about Automation
- Resistance - No targeting policy
- Did not win hearts & minds

Paul Hookham, Lloyds TSB Group European SEPG June 1997

More Mistakes

TSB

- Too Many Wise Men
- SPI or Product? - your choice
- Executive Commitment waned
- Consultants - succession plans?
- Many gaps after 2Q96 assessment
- Not seen as important - no impact on PRP
- Early Adopters / Early Majority Chasm

Paul Hookham, Lloyds TSB Group European SEPG June 1997

Good Practice

TSB

- Involve everybody
- Ensure management commitment is sustainable
- Integrate SPI activities in product issue logs
- Plan to have regular assessments
- Use external help effectively
- Keep it simple
- Local processes

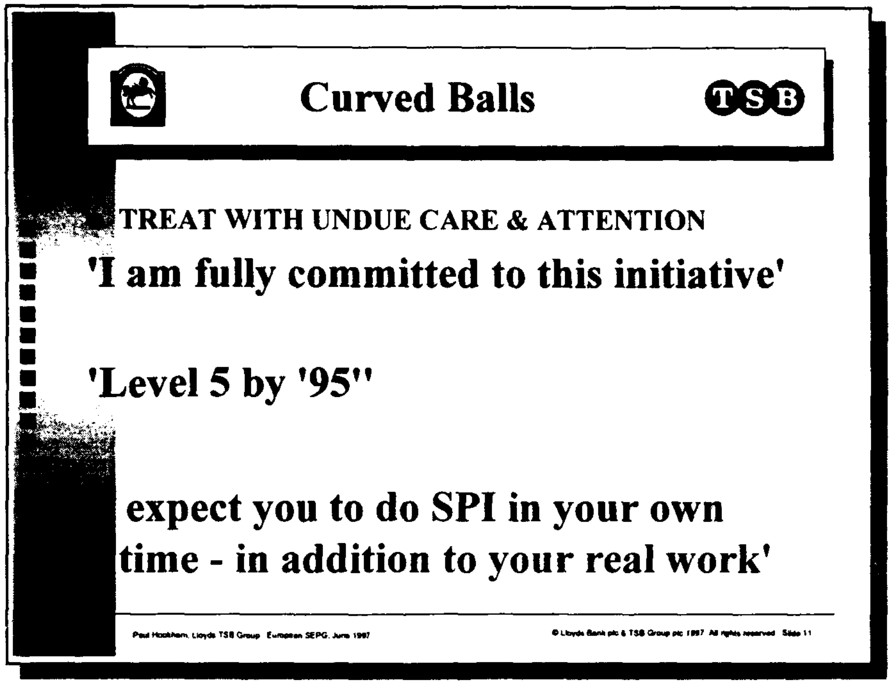
Paul Hockham, Lloyds TSB Group European SEPG June 1997

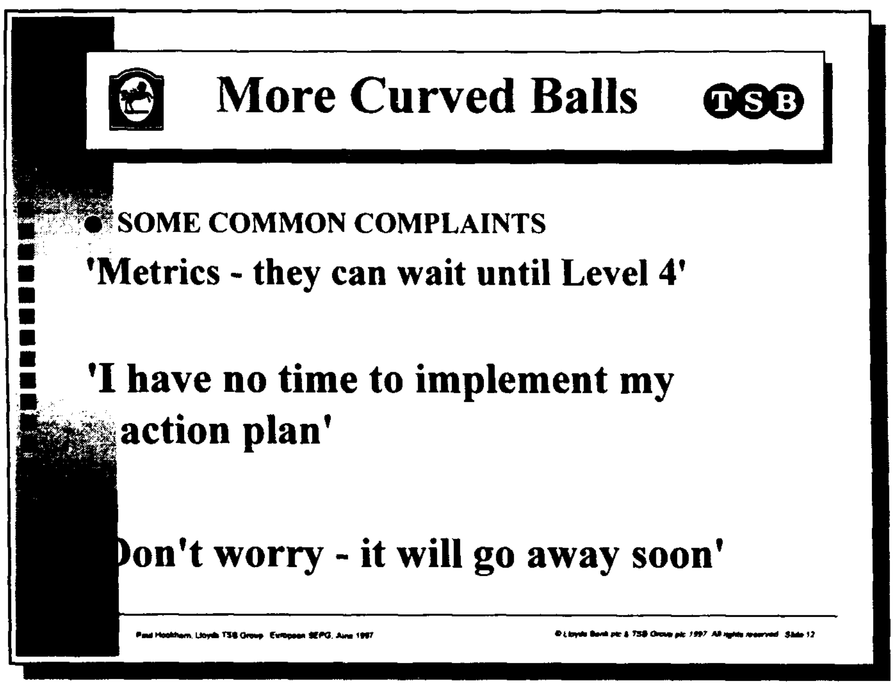
More Good Practice

TSB

- Harvest existing knowledge
- Target points of pain - Priority 1
- Go for the quick win - Priority 2
- Use CMM as a framework
- Ownership in the projects
- Encourage & support Special Interest Groups
- Involve your customers

Paul Hockham, Lloyds TSB Group European SEPG June 1997


Curved Balls
TSB
TREAT WITH UNDUE CARE & ATTENTION
'I am fully committed to this initiative'
'Level 5 by '95''
expect you to do SPI in your own
time - in addition to your real work'


More Curved Balls
TSB
SOME COMMON COMPLAINTS
'Metrics - they can wait until Level 4'
'I have no time to implement my
action plan'
on't worry - it will go away soon'

Successes

TSB

Configuration Management **

- Requirements Management

Risk Management **

* FULL TIME INVOLVEMENT IS KEY

Paul Hookham, Lloyds TSB Group European SEPG, June 1997

More Successes

TSB

- Realistic Scheduling
- Senior Management Commitment
- Project Awareness
- Intro to CMM - 3 day training

Paul Hookham, Lloyds TSB Group European SEPG, June 1997

Blueprint - 10 Critical Success Factors

TSB

- **STEP 1**

ESTABLISH SENIOR MANAGEMENT STEERING GROUP: -

SET POLICY
LAUNCH TRAINING & COMMUNICATIONS
MONITOR PROGRESS
PUBLICISE BUSINESS GOALS

Paul Hookham Lloyds TSB Group European SEPG June 1997

Blueprint - 10 Critical Success Factors

TSB

- **STEP 2**

ESTABLISH SENIOR MANAGEME T COMMITMENT: -

INTERNAL COMMUNICATIONS
SOCIAL EVENTS
TRAINING COURSE DINNERS
PUBLICISE SPI AT EVERY OPPORTUNITY

Paul Hookham Lloyds TSB Group European SEPG June 1997

Blueprint - 10 Critical Success Factors

TSB

- **STEP 3**

ESTABLISH AN AGREED TRAINING AND ASSESSMENT SCHEDULE WITH SENIOR MANAGEMENT & IMPLEMENT IT

- **STEP 4**

MANAGEMENT TEAMS ATTEND TRAINING AND PRODUCE ACTION PLANS FOR GAP CLOSURE

Blueprint - 10 Critical Success Factors

TSB

- **STEP 5**

MANAGEMENT TEAMS PRESENT THEIR ACTION PLANS TO THEIR TEAMS & DELIVER A CMM OVERVIEW TO THEM - TO SHOW COMMITMENT

Blueprint - 10 Critical Success Factors

TSB

- **STEP 6**

SCHEDULES FOR IMPLEMENTATION OF ACTION PLANS ARE PRODUCED 3-4 WEEKS AFTER TRAINING

FORWARDED TO SEPG FOR TRACKING, CONSOLIDATION & ONWARD SUBMISSION TO STEERING GROUP

Paul Heathorn Lloyds TSB Group European SEPG June 1997

Blueprint - 10 Critical Success Factors

TSB

- **STEP 7**

ISSUES AND PROGRESS ARE TRACKED AND MONITORED BY STEERING GROUP, VIA STANDARD PROGRESS REPORTING

- **STEP 8**

EXTERNAL CBA-IPI, BY FUNCTION, 3-4 MONTHS AFTER TRAINING USING SEI LEAD ASSESSOR

Paul Heathorn Lloyds TSB Group European SEPG June 1997

Blueprint - 10 Critical Success Factors

TSB

- **STEP 9**

REVISE ACTION PLANS AND SCHEDULES TAKING INTO ACCOUNT ASSESSMENT FINDINGS

- **STEP 10**

PERFORM AN INTERNAL RE-ASSESSMENT 6-9 MONTHS AFTER EXTERNAL CBA-IPI

Paul Hookham, Lloyds TSB Group European SEPG, June 1997

 Slide 21

What Next?

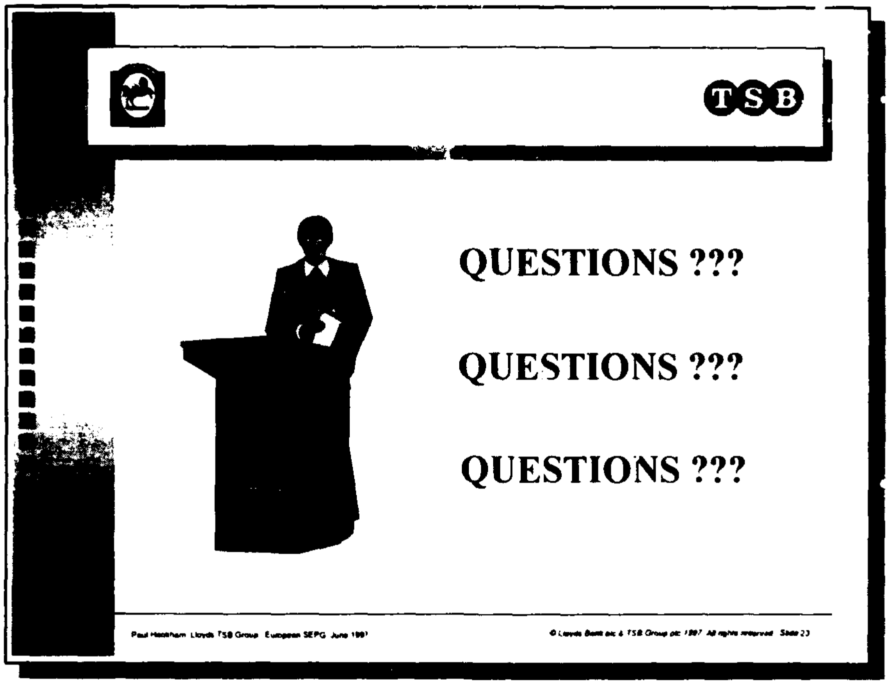
TSB

- Automation
- Software Acquisition CMM
- Train the Trainer
- Internal SEI Lead Assessor
- Sub Contractor Evaluations
- Peer Reviews

WHO KNOWS ?

Paul Hookham, Lloyds TSB Group European SEPG, June 1997

 Slide 22


TSB
QUESTIONS ???
QUESTIONS ???
QUESTIONS ???
Lloyds TSB Group European SEPG June 1997
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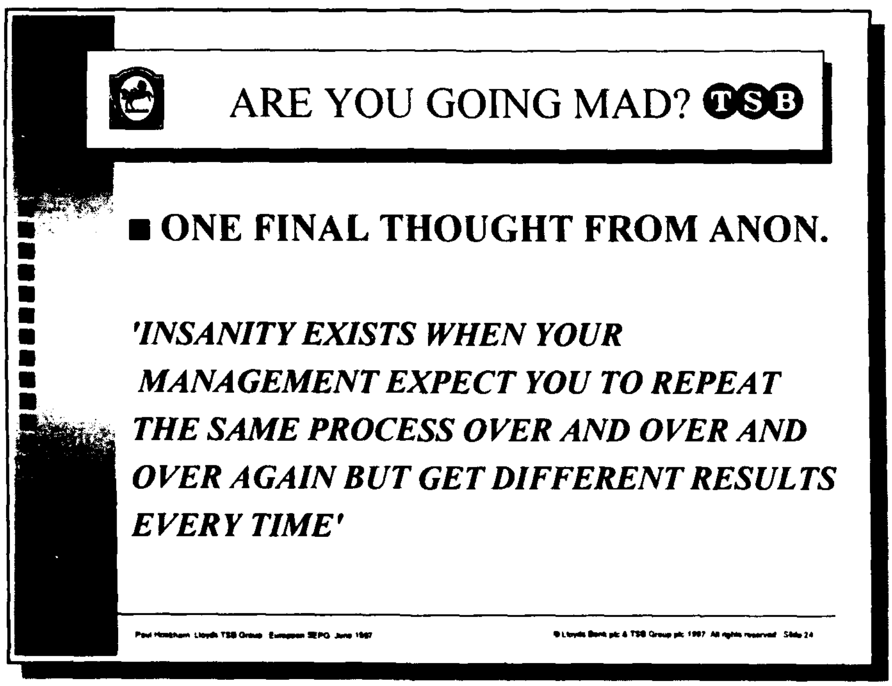
ARE YOU GOING MAD? TSB
■ ONE FINAL THOUGHT FROM ANON.
'INSANITY EXISTS WHEN YOUR MANAGEMENT EXPECT YOU TO REPEAT THE SAME PROCESS OVER AND OVER AND OVER AGAIN BUT GET DIFFERENT RESULTS EVERY TIME'
Lloyds TSB Group European SEPG June 1997
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European SEPG - June 18, 1997

Requirements for Winning Software Teams

Bill Curtis
TeraQuest Metrics
Austin, Texas
&
Software Engineering Institute
Carnegie Mellon University

This talk can be accessed at **http://www.teraquest.com**

TeraQuest 1 Winning SW Teams © 1997 TeraQuest

From Individuals to Teams

This presentation assumes there is a progression of steps through which many organizations must pass to install empowered teams

Individuals

Craft

Workgroups

Traditional organization

Teams

Team-based organization

This progression underlies the staging of some key practices, key process areas, and maturity levels in the People Capability Maturity Model

TeraQuest 2 Winning SW Teams © 1997 TeraQuest

Advantages of Workgroups

- **Load levelling**
- **Coordination of tasks**
- **Reduced span of control**
- **Improved performance**
- **Shared learning**

TeraQuest 3 Winning SW Teams © 1997 TeraQuest

Interpersonal Communication Skill

Listening and interpreting

Group dynamics

Multicultural sensitivity

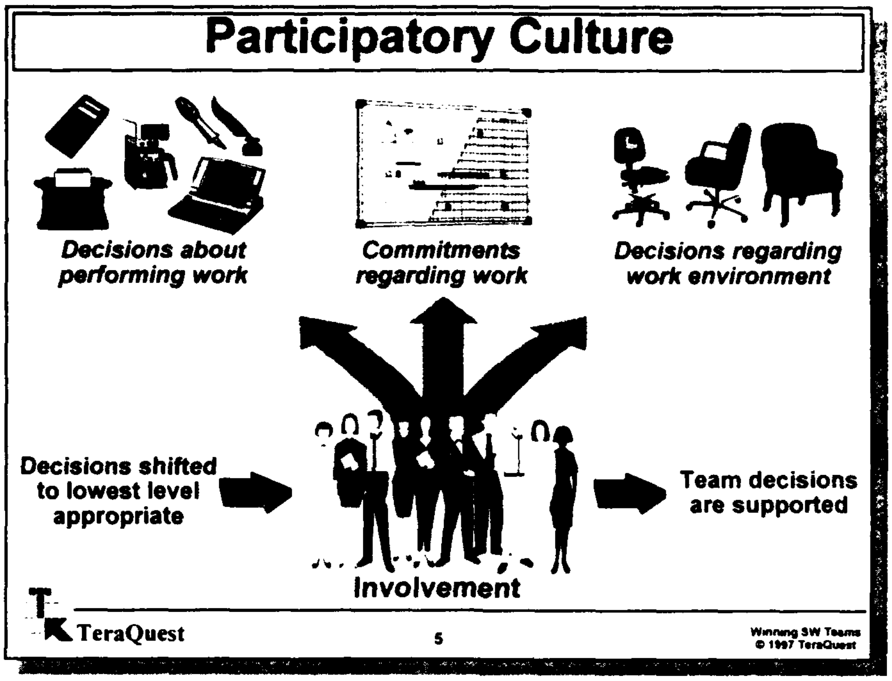
Problem resolution

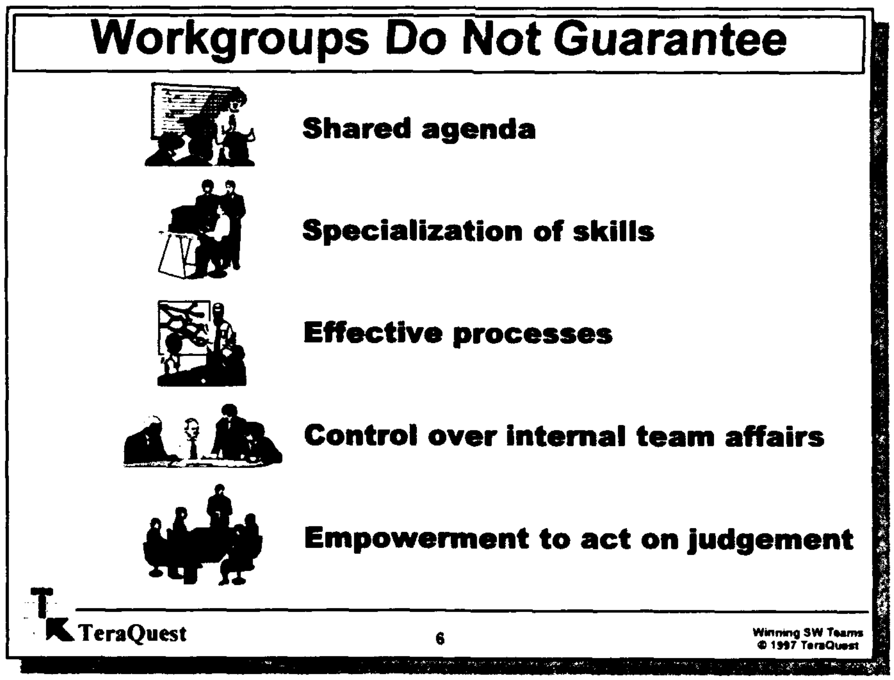
Negotiation

Coordination

Teams require a solid foundation in interpersonal communication and coordination skills

TeraQuest 4 Winning SW Teams © 1997 TeraQuest


Participatory Culture
Decisions about performing work
Commitments regarding work
Decisions regarding work environment
Decisions shifted to lowest level appropriate
Involvement
Team decisions are supported
TeraQuest
5
Winning SW Teams
© 1997 TeraQuest

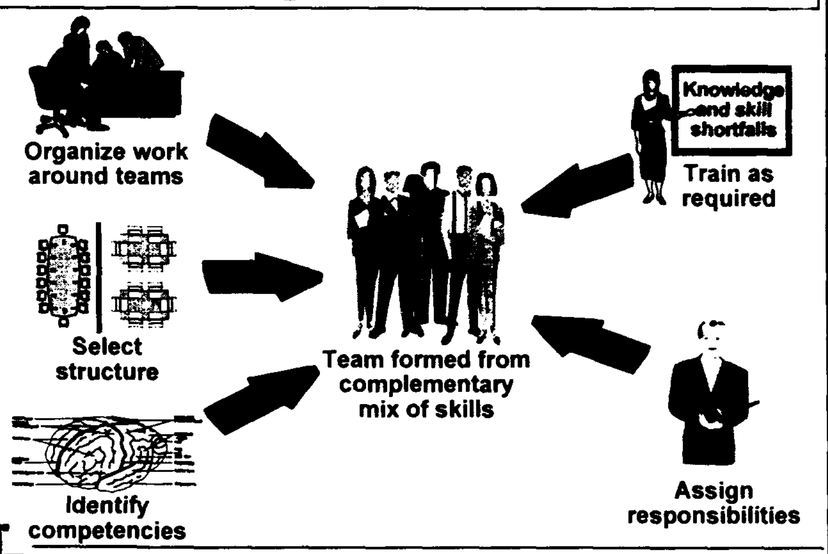

Workgroups Do Not Guarantee
Shared agenda
Specialization of skills
Effective processes
Control over internal team affairs
Empowerment to act on judgement
TeraQuest
6
Winning SW Teams
© 1997 TeraQuest

Team Building Pre-Conditions

Formal team building should only be used where conditions are favorable for team implementation

- interdependency of action
- participatory culture
- effective control over work
- shared goals
- measurable team performance
- commitment by each individual
- complementary skills
- facilitative management
- aligned with organizational goals

Initiating Software Teams



Characteristics of Teams

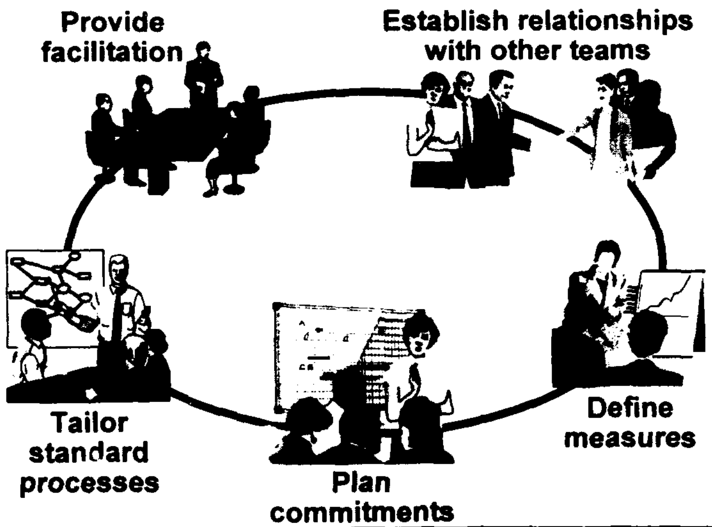
Empowered — "...they do not have to go through hierarchical approval for many of their decisions about how to do their work." (Mohrman et al., 1995)

Self-Managed — "...they perform for themselves many of the tasks that management used to perform..." (Mohrman et al., 1995)

Warning — empowerment and self management do not mean that teams are free to pursue their own agendas. With empowerment comes responsibility.

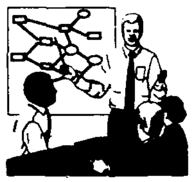
S. Mohrman, S. Cohen, & A. Mohrman (1995). *Designing Team Based Organizations.* San Francisco: Jossey-Bass.

Empowered Execution



Providing Standard Team Processes

Teams should be given a process they can tailor rather than be forced to thrash for months creating their own



Team **S**oftware **P**rocess

coming from Watts this August at the SEI Symposium

TeraQuest 11 Winning SW Teams © 1997 TeraQuest

Team Workforce Practices

Workforce practices adjusted for use with teams

Team-Based Workforce Practices

Team recruiting

Selection methods

Team orientation

Performance mgt.

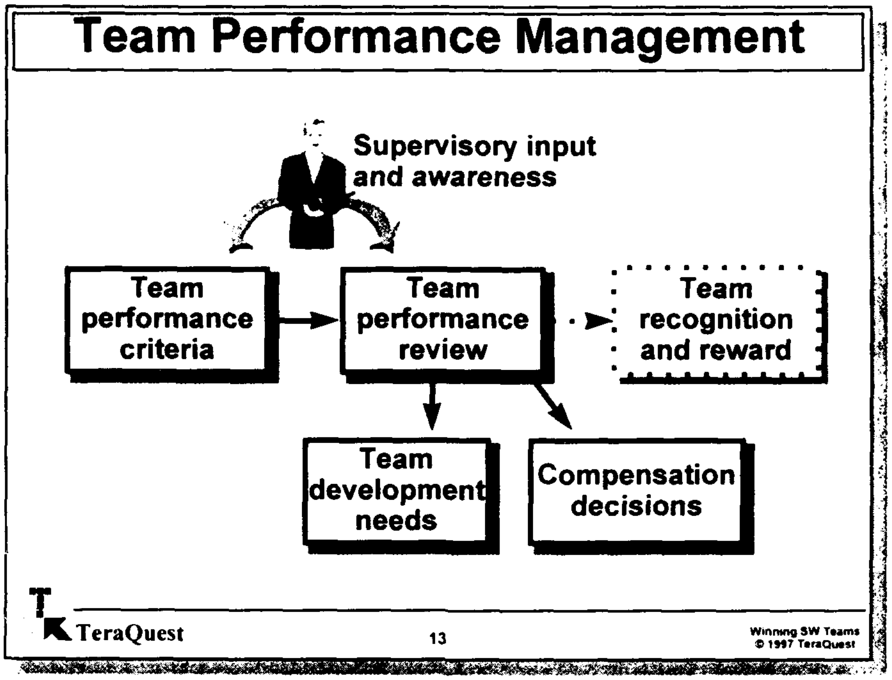
Training needs

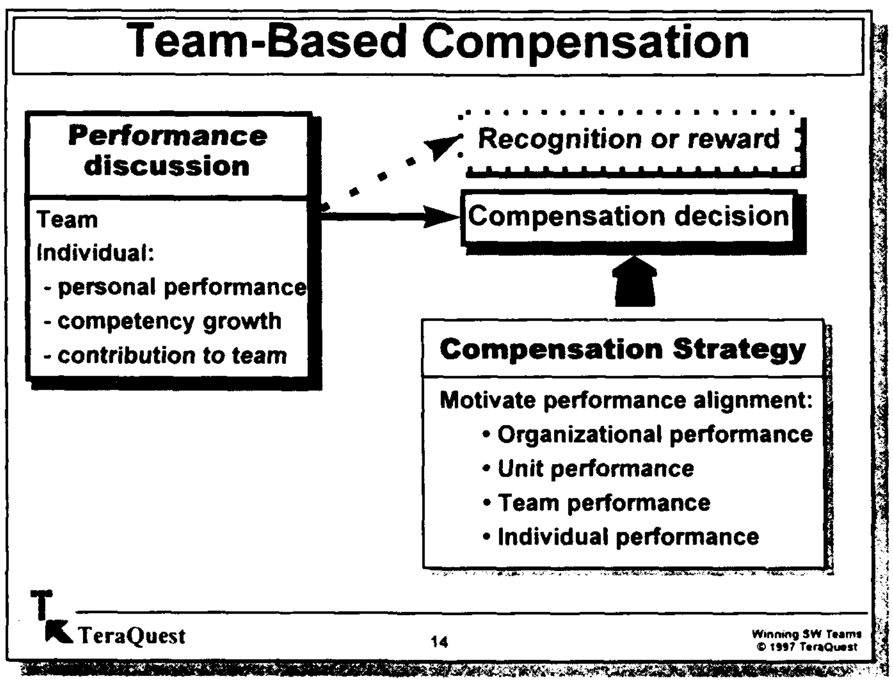
Compensation

Workforce planning

Team members involved in performing some practices

TeraQuest 12 Winning SW Teams © 1997 TeraQuest


Team Performance Management
Supervisory input and awareness
Team performance criteria
Team performance review
Team recognition and reward
Team development needs
Compensation decisions
TeraQuest
13
Winning SW Teams
© 1997 TeraQuest


Team-Based Compensation
Performance discussion
Team
Individual:
- personal performance
- competency growth
- contribution to team
Recognition or reward
Compensation decision
Compensation Strategy
Motivate performance alignment:
• Organizational performance
• Unit performance
• Team performance
• Individual performance
TeraQuest
14
Winning SW Teams
© 1997 TeraQuest

Conclusions

Teams do not replace individuals and their performance

Workgroups coordinate the work of individuals

Teams empower individuals to better integrate complementary skills and more fully utilize their judgement in executing interdependent tasks

An excellent so...

Mohrman, S.A., Cohen, S.G., & Mohrman, A.M. (1995). *Designing Team-Based Organizations.* San Francisco: Jossey-Bass.

TeraQuest 15 Winning SW Teams

Challenges and solutions for SPI in a small company

Romana Vajde Horvat, Ivan Rozman

University of Maribor,

Faculty of Electrical Engineering and Computer Science

Institute of Informatics

UNIVERZA V MARIBORU

Content

- Introduction
- Types of small companies
- Challenges for SPI in small companies
- PROCESSUS SPISC model
- Conclusion

Introduction

- 1986-1996: a decade of SPI in large companies
- results and consequences:
  - experiences, knowledge
  - mature SPI and SP assessment models
  - higher quality criteria on SW market

Types of small companies

- definition of term "small company": depends on type of company
- Types of small companies:
  - branch company
  - independent company
  - IT department within enterprises

Types of small companies...

Branch company

- establishment: supported by partner - large company
  - financing,
  - equipment,
  - training
- SPI projects conducted according to policy of large company
  - defined procedures, required results of each procedure

Types of small companies ...

Independent company

- establishment:
  - enthusiasm of individuals,
  - insufficient budget, equipment, ...

No. of Employees	Size of Company
up to 15	small independent company
15 to 50	medium-sized independent company
over 50	large independent company

Types of small companies ...

IT department

- organizational unit within enterprise
- process of work is defined within IT department, but it should be **compliant** with **global policy** of enterprise
- customers: other departments within enterprise

Challenges for SPISC

- great dependency on individuals
- disposition of roles
- large impact of the human factor
- dependence on few projects
- importance of communication with customers
- difficulties with investing into SPI

PROCESSUS SPISC model

- models for SPI in small companies (SPISC) should:
  - be easy to understand
  - provide firm guidance using a supporting documentation
  - provide SPI results compliant with market requirements

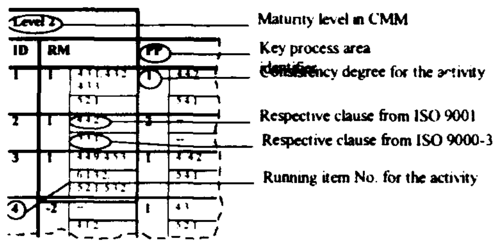
PROCESSUS SPISC model...

Background

- based on:
  - detailed comparison and integration of ISO 9001, ISO 9000-3 (ISO model) and CMM
  - experiences with SPI in small companies

PROCESSUS SPISC model…

Comparison of ISO model and CMM



CD value	Meaning
2	Activity is defined **only in CMM.**
1	Activity is defined **in both models although CMM is more extensive.**
0	Activity is **equally defined in both models.**
-1	Activity is defined **in both models but ISO adds new aspects.**
-2	Activity is ***defined only in ISO model.***

PROCESSUS SPISC model…

Integration of ISO model and CMM

- According to the results of comparison
  - new KPAs
  - new activities
  - enhanced activities

  are incorporated into framework of original CMM
- Characteristics of small companies require change of sequence for some KPAs

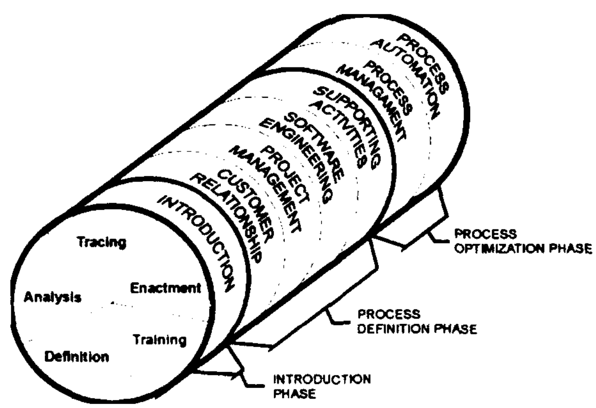
PROCESSUS SPISC model...

Framework

- For introducing of each procedure following activities should performed:
  - analysis
  - definition
  - training
  - enactment
  - tracing

PROCESSUS SPISC model...

Framework



PROCESSUS SPISC model…

Introduction phase

- assignment and training of quality manager
- definition of SPI plan
- definition of organizational structure
- definition of process documentation structure
- introduction of SPI concepts to personnel
- definition of few simple metrics

PROCESSUS SPISC model…

Process definition phase

- Customer relationship management
  - *contract management*
  - *requirements management*
  - *product delivery*
  - *maintenance*
- Project management
  - *project plan*
  - *quality management activities*
  - *reviews of input and output of phases*

PROCESSUS SPISC model...

Process definition phase

- Software engineering
  - *definition of procedures for software engineering, considering used methodologies and tools*
- Supporting activities
  - *training*
  - *document control*
  - *included product management*

PROCESSUS SPISC model...

Process optimization phase

- Process management
  - *metrics*
  - *internal reviews*
  - *corrective actions*
- Process automation
  - *supporting and automation of activities - internal applications, groupware, etc..*
  - *PSEEs (Process-centred software engineering environments)*

PROCESSUS SPISC model...

Process documentation

- structure:
  - QM - Quality Manual
  - SP - Standard Procedure (17)
  - SD - Standard Documents (forms, templates, manuals - app. 2 for each SP)

No.	Standard Procedure	Standard Document
1	Contract management	F Contract review checklist T Contract
2	Requirements management	F Requirements change request T Requirements specification
3	Product Delivery	F Acceptance checklist F Acceptance report
4	Maintenance	F Maintenance request F Maintenance report

PROCESSUS SPISC model...

Disposition of roles

M - manager
PM - project manager
QM - quality manager
D - developer
DC - developer coordinator

No.	Standard Procedure	Roles		
		Implementator	Assistant /Adviser	Quality controller
1.	Contract management	M	PM, QM	QM
2.	Requirements management	PM	M, D	QM
3.	Product Delivery	D	PM	QM, M
4.	Maintenance	D	PM	QM

Conclusion

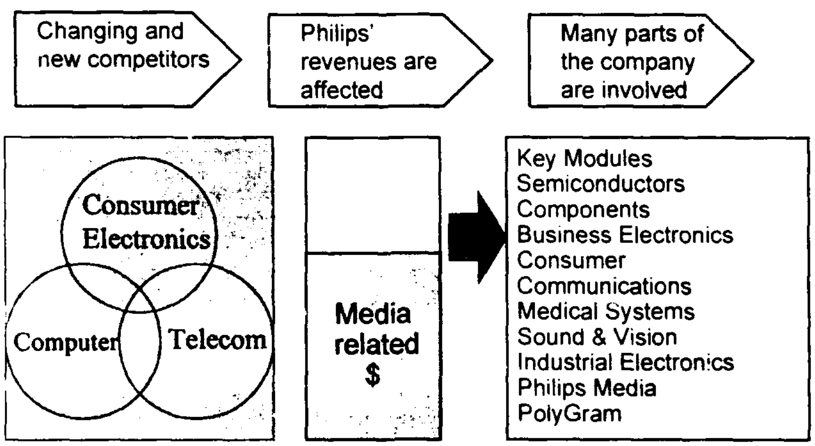
- Process definition and application in projects: app. 18 month
- Influence of human factors on the SPI project is important
- Process and project documentation are significant burden - the need for support and automation is evident

Software Process Improvement Support

Lieuwe Sytse de Jong
SPI Manager
Philips Business Electronics
E-Mail: LSdeJong@compuserve.com

Let's make things better. PHILIPS

Software is critically important to Philips

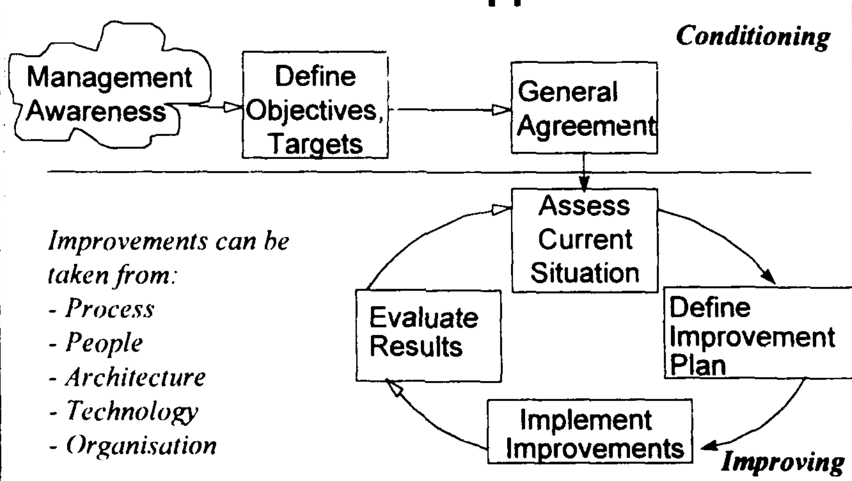


Embedded Software in Philips

- 2500 - 3500 Software Engineers in 110 Groups
- Fast Growing in Complexity
- Maturity varies from Level 1 to Level 3
- Have experienced several Software Crises
- Application Areas vary from Software Systems:
  Video Communication, Telecom, Medical, ...
  to Software Products:
  Speech Processing
  to Firmware:
  Television, Audio, Set Top Box, Cameras,....

Philips Business Electronics *Let's make things better* PHILIPS

PHILIPS' SPI Approach



Philips Business Electronics *Let's make things better* PHILIPS

Overall Targets 1997

Software quality

Improve current Post-release and Final Test Defect Density by factor 2

Software maturity

Improve at least one CMM-level

Software education

Participation in 2-day workshop 'Software Business' for management teams where software is strategic

Philips Business Electronics — Let's make things better — PHILIPS

SPI Support Organization

- SPI Task Force
  (PHILIPS CTO is Chairman)
- SPI Steering Committee (operational Tasks)
- SPI Management at PD Level
- SPI Coordination at BU Level
- SPI Steering Committees at BU Level
- SPI Consultation in Philips' Origin

Philips Business Electronics — Let's make things better — PHILIPS

Philips' SPI Support

- The Business Unit is the Owner of the SPI Process
- First Improvement Steps need to be practical
- "Plan, Do, Check, Act" Cycles are essential
- Every Organisation is different, for example:
  - Nationality
  - Position at the learning Curve
  - Flexibility
- Assessment is relatively easy
- Deployment of the new Processes is the most difficult Part

Philips Business Electronics Let's make things better. PHILIPS

SPI Support Experiences

- SPI is dealing with Management of Change
- Roadblocks that are often encountered in Philips:
  - Lack of Management Awareness/ Direction
  - Culture of an Organisation (Hardware Oriented)
  - Competition of real Projects
  - Lack of Change Management Skills
  - Lack of Involvement of non-technical Roles

Philips Business Electronics Let's make things better. PHILIPS

SPI Results

- Senior Management Awareness has grown
- Most Software Groups have running SPI Programs
- Process Maturity and Software Knowledgability grow
- Metrics are essential to demonstrate Improvement
- Collective learning Mechanisms work well

Philips Business Electronics

Let's make things better.

PHILIPS

ALCATEL

European SEPG '97

Approaches to Process Improvement Support

Fillip A.L. Halsey
Software Process Improvement Manager
Alcatel Telecom Norway AS

Wednesday 18th June

Alcatel Telecom Norway AS — fah/amsterda.fm5/18 06 97 — 1/9

ALCATEL

European SEPG '97
Alcatel Telecom Norway AS

- Assessment November 1995
- Process Improvement based on the Capability Maturity Model (CMM)
- (Software) Process Improvement - π project started Jan. 1996
- Reports directly to senior mngmnt.
- Process improvement organised through small groups - Task Forces
  - 3-5 people part-time (20-50%)
  - Focused on relatively small improvements
- One person full-time — Project Manager

Alcatel Telecom Norway
Defence Communications Division

- Part of Alcatel Telecom Norway (legal entity)
- Part of Alcatel Alsthom/Alcatel Telecom, Radio Space & Defence group (- business)
- 280 employees + ~40 consultants
- ~200 involved in development (85% SW related)
- Develop, produce and sell tactical and strategical military telecommunications systems, including *cryptographic and message handling systems*

- *Attempts on doing process improvement before 1995*
- Small and relatively large scale
- Attempts not classified as successful
- Lack of org. & mngmnt. support one reason

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European SEPG '97
Identified Challenges

- ▼ Creating a process improvement organisation that works.. .
- ▼ Obtaining and keeping both senior management and organisational support
- ▼ Obtaining qualified people for doing process improvement
- ▼ (Creating action plans and maintaining these)
- ▼ Once working groups (we call these task forces) are established, assure that they do something sensible.....

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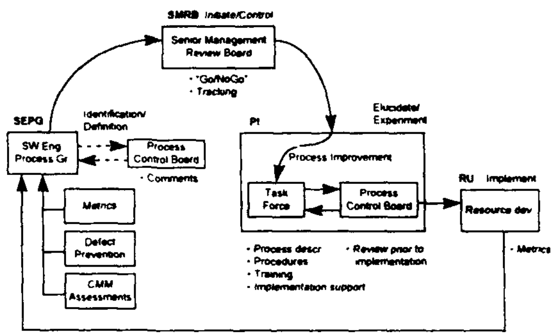
European SEPG '97
Process Improvement Organisation

- ▼ Senior management has a specified responsibility
  - Prioritising improv.
  - Go/no go, tracking
  - Sponsoring task forces



- ▼ SEPG (as we have defined it) is responsible for:
  - Establishing and running a metrics program
  - Identifying potential improvements through metrics, assessments and def. prev.
  - Define and present the improvement for SMRB

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European SEPG '97
Process Improvement Organisation

- Process Improvement (PI) is responsible for investigating the improvements through task forces:
  - What & how to improve
  - Conducting the experiment
  - Establishing new procedures and a training program
  - The Process Control Board is an "impartial" group who will evaluate the output from the task force
- Resource development (RU) is the organisations responsible for methods & technology and they are therefore the customers of the project PI. RU are responsible for implementation and tracking of implemented improvements

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European SEPG '97
Obtaining Support

- Senior Management (SMRB) support is obtained through:
  - Establishing cost/benefit analysis pr. improvement
  - SMRB prioritising improvements (which to run, which to delay, ...)
  - SMRB sponsoring each task force (one from SMRB per TF) - special responsibility vs tracking, helping etc. the TF
  - Regular progress report meetings

+ SUCCESS

- Organisational support is obtained through:
  - Participation in assessment
  - Meeting with everybody (every 6 months) in small groups to discuss the organisations needs, prioritations, plans for improvement etc.
  - Releasing π-news bi-monthly, giving updates on progress, future plans, prioritations, ...
  - Having as many as possible participate in PI — TF's, reference groups, PCB

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European SEPG '97
Obtaining Qualified People

- Identifying smaller improvements which can be done in ~6 months in a project with 3-4 people 20-50%:
  - It is possible to release "good" people from "important" projects <50% for <6 months....

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European SEPG '97
Working Groups

- We call our working groups task forces, and we try to obtain good progress by:
  - Running kick-offs (focus on establishing a common set of goals, CMM, detailed planning next 2 months)
  - Doing a workshop on the topic in question (e.g. requirements management)
  - Having bi-weekly progress report meetings
  - Arranging monthly/bi-monthly meetings with a reference group for advice, discussions etc.
  - Arranging 1 till 2 meetings with senior management for advice, discussions etc.
  - Employing external consultants, specialising in the topic in question, to help in addressing the right questions, going through the right process, obtaining an overview sooner, etc.

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European SEPG '97
What We Should Improve

- Support for the project manager of PI to:
  - Improve the current process (running TF's, obtaining support, "seeing other ways of doing things", etc.)
  - Have somebody to discuss issues with
  - Employing a "devils attorney"
- Arrange mini-assessments and relate findings to current business status/goals - re-establish/strengthen senior management support/commitment

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Practical Implementation of Process Improvement

Keith Jackson
TBL
Mead House
Heathfield Lane
Chislehurst
Kent BR7 6AH

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Fax: +44 (0)181 467 7843
Email: Keith Jackson2@compuserve.com

Ref KJ SEPG 97 1

Objectives

To provide guidance and support to an organisation that has completed an assessment and needs to deploy improvement activities.

To provide do's and don'ts on how to successfully establish and deliver an improvement programme.

To discuss lessons learned from software process improvement experiences.

Ref: KJ SEPG 97 2

Contents

- Why bother?
- Why do most Process Improvement initiatives fail?
- A common dilemma
- 5 Common success features
- 6 Principles of Process Improvement
- How do we do it - in practical terms?
- How do we manage change?
- How do we reduce risk?

TBL Ref. KJ SEPG 97 3

Why bother?

- 80% of Process Improvement initiatives fail

(Based on SEI data 1996)

TBL Ref: KJ SEPG 97 4

Why do they fail?

- Management back out
- Wrong time
- Staff inexperience
- No management of change
- Ineffective implementation

 Ref: KJ SEPG 97 5

After the Assessment

Many organisations

- Stall after an assessment
- Do not have an action plan
- Fail to implement any improvement tasks
- Fail to realise the benefit of software process improvement

 Ref: KJ SEPG 97 6

When applied properly, Process Improvement delivers:

- Measurable improvements in time to market, predictability, productivity and delivered quality
- Survival (which is of course not compulsory!)
- Improvement of bottom line performance

TBL Ref KJ SEPG 97 7

Organisations Have a Common Dilemma

- How do we move to a level 2 or level 3 maturity level when we are a level 1 organisation?
- Because we don't have a level 2 or level 3 infrastructure and level 2/level 3 KPA experience it will take us an average of 3-5 years to move from level 1 to level 2 and 2 years from level 2 to level 3.
- Using external help, we can move from level 1 to level 2 with lower risks and lower costs in 2 years - sometimes quicker

TBL Ref: KJ SEPG 97 8

Successful SPI Initiatives Have Five Common Features

1) Executive management commitment and direction.
2) Management of change - Culture and communication.
3) Proven SPI model.
4) Education and training.
5) Measurement and metrics.

 Ref: KJ SEPG 97 9

Six Principles of Process Improvement

1) Improvement direction must start at the top
2) Everyone must be involved in the improvement process
3) Effective improvement requires knowledge of current process
4) Improvement is continuous
5) Improvement requires investment
6) Use external help to reduce risks and shorten timescales

 Ref: KJ SEPG 97 10

How, in practical terms?

1 Customer focus

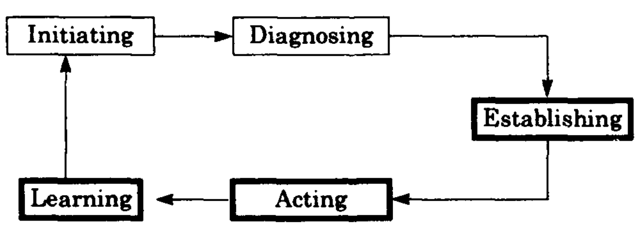
"Any Process Improvement initiative exists to serve the business needs of the organisation. It is not the other way around."

2 A project based approach

initiate
diagnose
establish
action
learn

 Ref KJ SEPG 97 11

The IDEAL Model SM



 Ref: KJ SEPG 97 12

How, in practical terms?

3 Delivering results

- clear phases
- fixed deliverables
- management buy-in and sign-off
- quick wins
- measurable results

 Ref: KJ SEPG 97 13

How, in practical terms?

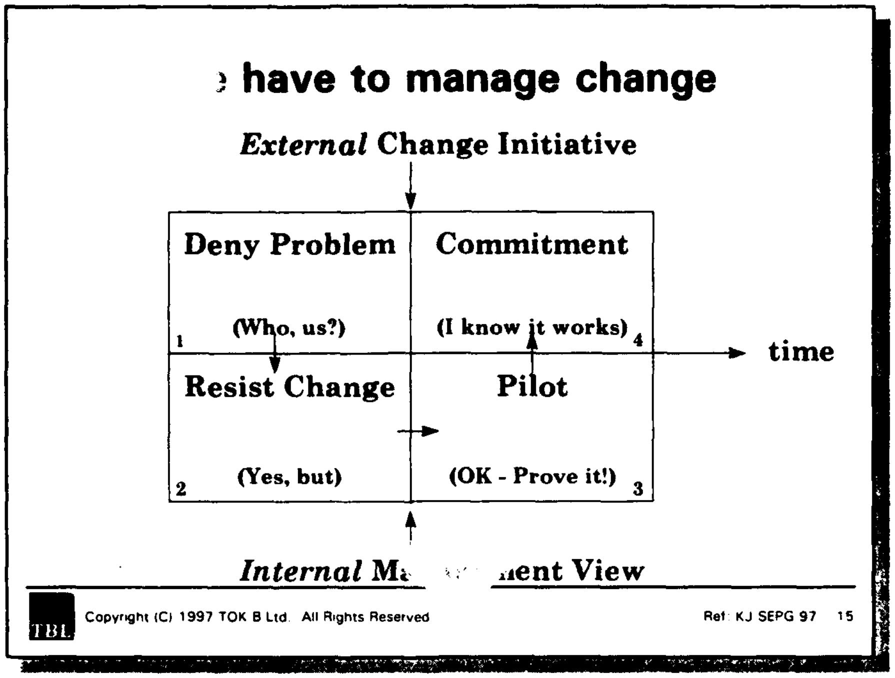
4 Recognise difficulties of change

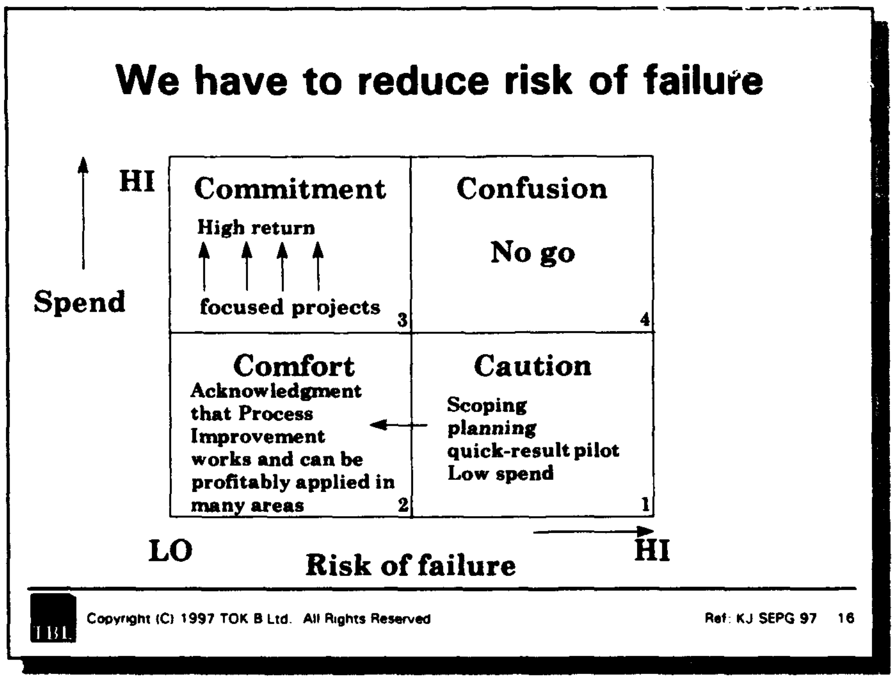
- think *strategically*
- plan *tactically*
- deliver *operational* processes

5 Recognise that we do not all start from the same point

- tell
- sell
- involve
- delegate

 Ref: KJ SEPG 97 14


have to manage change
External Change Initiative
Deny Problem
(Who, us?)
1
Commitment
(I know it works)
4
time
Resist Change
(Yes, but)
2
Pilot
(OK - Prove it!)
3
Internal M
ent View
Copyright (C) 1997 TOK B Ltd. All Rights Reserved
Ref: KJ SEPG 97 15


We have to reduce risk of failure
HI
Spend
Commitment
High return
focused projects
3
Confusion
No go
4
Comfort
Acknowledgment that Process Improvement works and can be profitably applied in many areas
2
Caution
Scoping
planning
quick-result pilot
Low spend
1
LO
Risk of failure
HI
Copyright (C) 1997 TOK B Ltd. All Rights Reserved
Ref: KJ SEPG 97 16

Cost of Implementation Failure

Each time an improvement effort fails to achieve its stated objectives, it incurs both short-term and long-term costs

	Short Term	Long Term
Direct	Wasted resources: • Money • Time • People Business goal not achieved	Business strategies not accomplished
Indirect	• Morale suffers • Job security threatened	• Lower confidence in leadership • Resistance to change increased • Next change more likely to fail

TBL Ref: KJ SEPG 97 17

Lessons Learned from Success and Failure

Business Process

- **Product and service definition**
- **Different assessment vehicles give different returns**

Measurement and Control

- **Simple metrics programme definitions**

Human Resources

- **Review your training needs early**
- **Recognise the value of SPI training**

TBL Ref: KJ SEPG 97 18

Lessons Learned from Success and Failure (cont)

Management of Change

- Business mission and goal definition
- Market scoping
- Strategic/Tactical Planning

Management Commitment

- Conferences such as SEPG can provide significant impetus
- Use workshops to involve management

Ref KJ SEPG 97 19

ISPI

Process Improvement Approaches

**European
Software Engineering
Process Group
Conference**

Amsterdam - June 18 1997

Tim Kasse
Institute for Software Process Improvement Inc.

Agenda

- ISPI Background
- Process Improvement Infrastructure
- Up Front Expectation Setting
- Business Objectives
- Guidance for Action Planning
- Incremental Approach
- Process Mentors
- Training, Action Planning, Incremental Approach, with Process Mentors Package

ISPI Background

Institute for Software Process Improvement Inc. (ISPI)

- Founded in 1991 by Tim Kasse and Jeff Perdue
- Incorporated in 1996

Spin-off of the Software Engineering Institute's Process Program

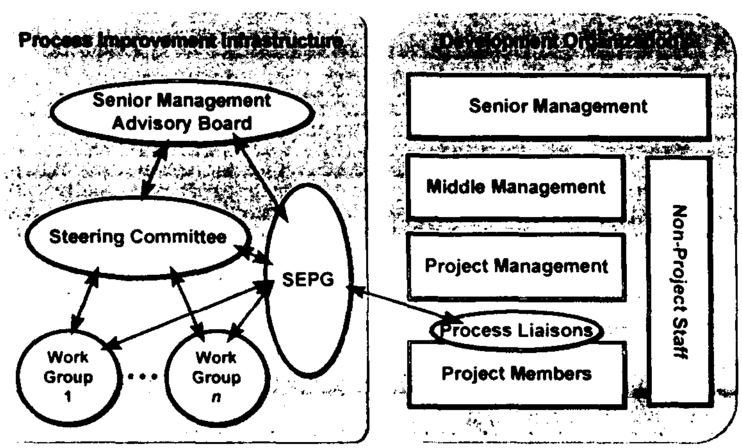
ISPI is an international, full service, process improvement consulting company, assisting organizations in implementing process improvements that support their Business Objectives

ISPI Background - 2

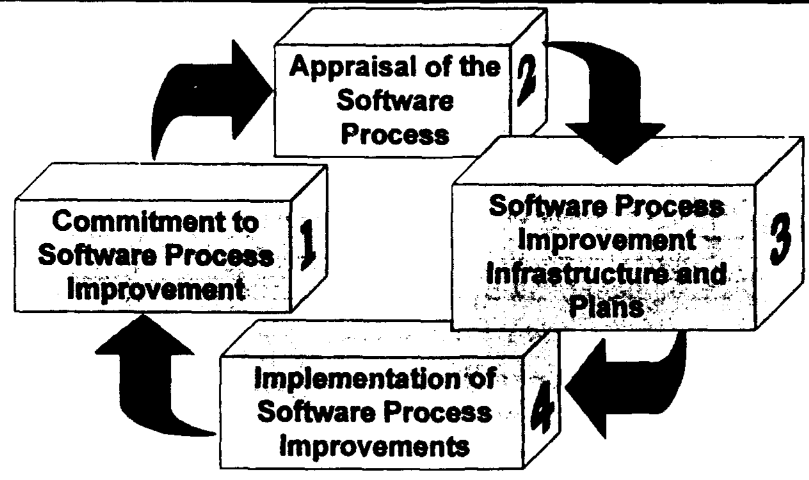
ISPI's process improvement consulting services include:

- Process improvement implementation support
- Action planning guidance and support
- Process improvement related training
- Assessments and Evaluations
- Process improvement awareness and expectation setting

Sample Improvement Infrastructure



Process Improvement Model
(Up Front Expectation Setting)



Business Objectives

A continuous process improvement initiative is one that encourages and supports change

It includes

- Setting expectations
- Training
- Conducting assessments
- Action planning
- Implementing the process improvement processes and procedures

First and foremost it supports an organization's Business Objectives

Guidance for Action Planning

The goal of the GAP is to prepare the foundation for an Action Plan by framing the process improvement program in terms of the assessment or evaluation results

Benefits of the GAP

The GAP provides management with the 'big picture'

- What needs to be done
- Who needs to be involved
- What it might take to accomplish true and lasting improvements

The GAP is the basis for management decision-making

- Determining priorities in light of corporate vision and current business environment
- Establishing visible commitment for the program

Benefits of the GAP? - 2

The GAP identifies process improvement roles and responsibilities for all levels of management and staff

The GAP provides important information for everyone involved in the development of the action plan

- Major initial steps in developing the Focus Area sections of the overall Action Plan
- Input into the context area of the Action Plan--the section that is generic to all of the Focus Areas
- Planning considerations when implementing fundamental change

Incremental Approach

Divide the process improvement activities into incremental phases that deliver improved practices every 3-4 months.

Each phase is composed of:

- Preparation
- Pilot
  - implementing the practices on a pilot project
  - evaluating and refining the practices if necessary
  - refining the overall plan if necessary
- Diffuse practices to other appropriate projects until it is institutionalized throughout the organization

Incremental Approach - 2

Each phase is designed to deliver one or more specific improvement activities or practices. These practices

- *Are managerial, organizational, technical, or mechanical*
- Must be introduced in functionally coherent sets
- Must be linked to the business objectives and priorities of the business unit
- Must be appropriately trained with coaching available during initial implementations
- Must be practical, proved, and adaptable to the business unit's needs

Process Mentoring

Process Mentors are experts in a Focus Area (e.g., Project Management) with a proven track record

Provide guidelines and constraints for the Working Groups or Process Action Teams to work within

Provide action planning and implementation guidance to focus area Working Group with possible support from In-house experts

- Expert mode
- Sharing mode
- Supporting mode

Process Mentoring

Provide samples, checklists, and starter kits from asset library and experience

Coach project leaders and practitioners in the use and adaptation of these assets

Monitor progress and provide continuous feedback (to projects and Process Action Teams)

Technology transfer should always be the Process Mentors' objective

Training, Action Planning, Incremental Approach, Process Mentor Package

Training is provided to the Process Action Team to provide necessary background in a focus area and a framework for the subsequent action planning

Process Mentors are either the ones who present the training or are in attendance when the training is presented

Process Mentors work with the Process Action Team to develop Guidance for Action Plan detail for the Focus Areas

Training, Action Planning, Incremental Approach, Process Mentor Package - 2

Process Mentors work with the Process Action Teams to refine the Implementation Tasks into implementable increments

Process Mentors work with the Process Action Teams to support projects for 2-3 increments

Progress is checked and the need for further Process Mentor involvement is determined

Summary

Process Improvement Initiatives can be enhanced and accelerated through

- **Establishing a SPI Infrastructure**
- **Taking more time to properly set expectations up front**
- **Tying the process improvement actions to the business objectives**
- **Providing a bridge between assessment or evaluation results and the Action Planning and Implementation**
  - **Help management to prioritize process improvement focus**
  - **Provide a starter kit for the Process Action Teams**

Summary - 2

- Implementing the process improvements using an incremental approach
- Using Process Mentors to coach and guide
- Combining training, action planning, and the incremental approach, with process mentors

ISPI

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Fax. 00 32 3 605 4876

http://www.ibp.com/pit/ispi

ESI

Carnegie Mellon University
Software Engineering Institute

ESEPG 1997

Amsterdam 16-19 June 1997

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SPICE and ISO/IEC 15504

Bob Smith - European Software Institute
Steve Masters - Software Engineering Institute

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Agenda

- Introduction and Background
- SPICE Trials Organisation
- Phase 2 Trials Objectives and Status
- Market Transition
- Report from Working Group 10
- Conclusion

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What is SPICE?

- Development of an International Standard on Software Process Assessment
- The SPICE project created to:
    - ensure fast development route
    - solicit opinions and input of world experts
    - carry out early trials
    - provide early feedback
    - create awareness of the new standard
- SPICE - Software Process Improvement and Capability dEtermination

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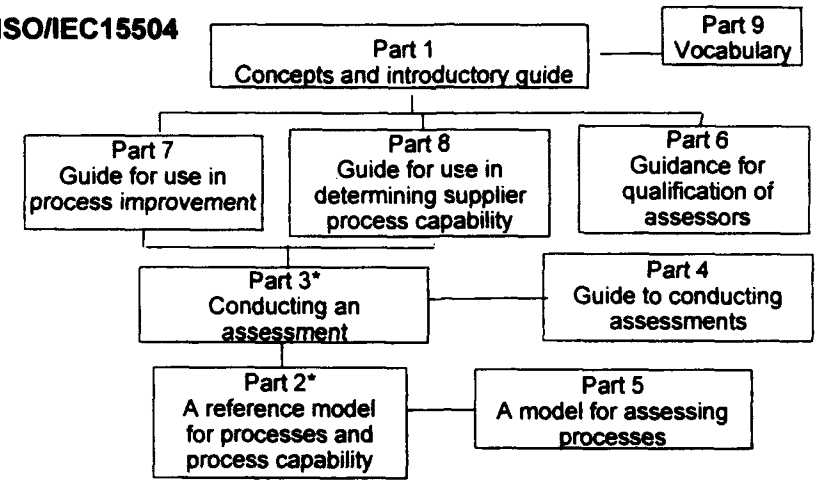
ISO/IEC15504



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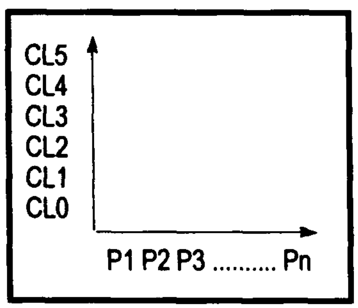
SPICE - the reference model

- Two-dimensional model for processes and process capability
- Capability Levels
  - Process Attributes
- Process Categories
  - Processes



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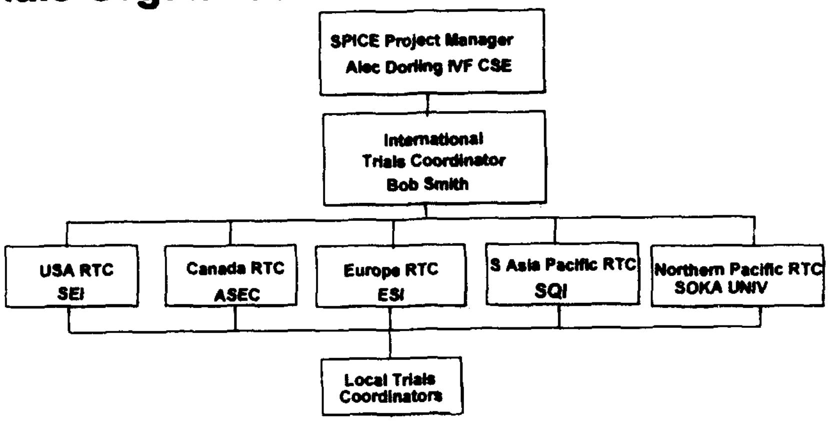
Trials Organisation



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Phase 2 Objectives

- Adequacy of
  - Reference Model
  - Requirements for Conducting an Assessment
- Usefulness of guidelines for
  - Process Improvement
  - Capability Determination
  - Assessor Qualification and Training
  - Conducting a Software Process Assessment

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Trials Questions

- Does the Reference Model provide :-
  - a correct and well-defined set of processes
  - a well-constructed system of process capability
  - a usable rating scale
  - a means for assessment model compatibility
- Does the Assessment Model provide:-
  - *a good mapping to the Reference Model*
  - a well-defined set of process indicators
  - a well-defined set of process management indicators
- Are the Requirements for Assessment :-
  - well-defined and understandable

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More Trials Questions

- Who has used SPICE and what do they think ?
- What is the cost of performing an assessment ?
- How does process maturity relate to project performance ?
- Does assessment aid process improvement ?

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Phase 2 Trials Studies

- Repeatability
- Comparability
- Process Capability Determination
- Process Improvement
- Applicability
- Assessment Model
- Assessment Performance

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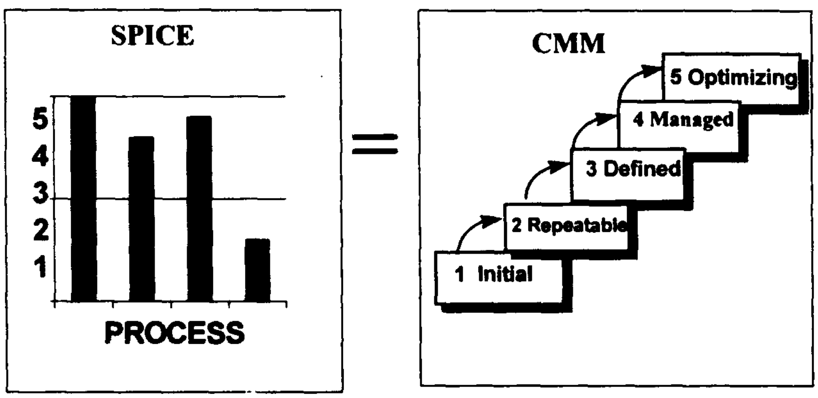
Can Results be Compared ?



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SPICE PROCESS PROFILE

CL 5	P	N	N	N	N	N	N	N	N	N	N	F	F
	L	N	P	N	N	N	N	N	N	N	N	F	F
CL 4	L	P	L	P	P	P	P	P	P	P	P	F	F
	L	L	L	P	P	P	P	P	P	P	P	F	F
CL 3	F	L	F	L	L	L	P	P	F	F	F	F	F
	F	L	F	L	F	L	P	P	L	F	F	F	F
CL 2	F	F	F	L	F	L	P	L	F	F	F	F	F
	F	F	F	F	F	F	P	F	F	F	F	F	F
CL 1	F	F	F	F	F	F	L	F	F	F	F	F	F

SPICE PROCESS

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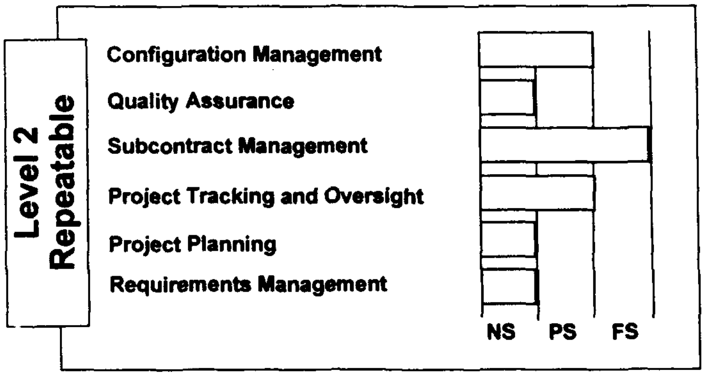
CMM Assessment Output



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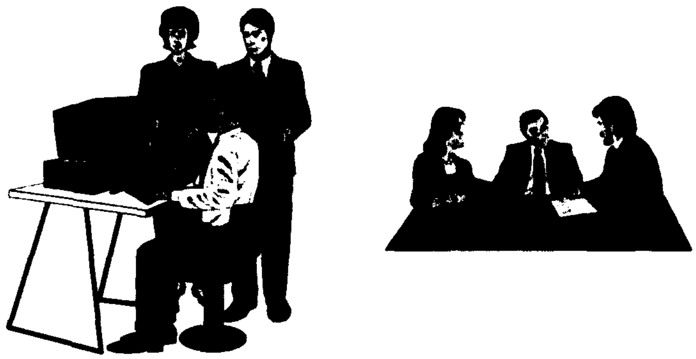
Are the Results Repeatable ?



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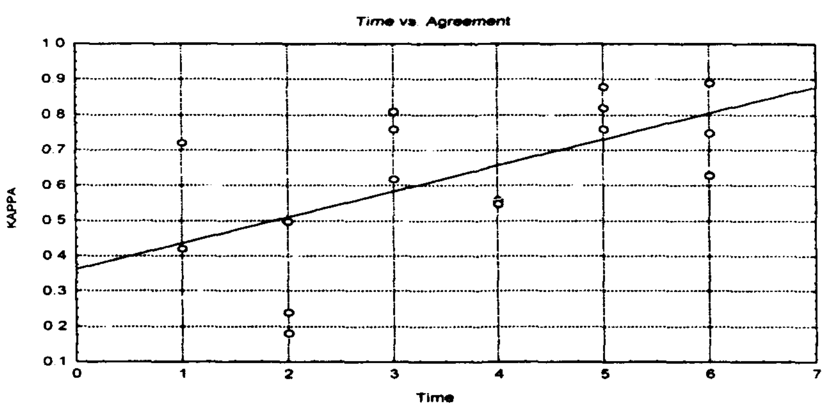
Reliability - method design



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Trials Status

REGION	REGISTERED	COMPLETED	DATA RETURNED
Europe	72	18	2
USA	8	0	0
Canada Central & South America	8	0	0
Southern-Asia-Pacific	42	25	6
Northen-Asia-Pacific	15	0	0
Totals	145	43	8

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Who Can Participate

- Organisations
- Assessors
- Model Providers
- Method Providers
- Assessment Tool Providers

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Market Transition - 1

- Compatible Assessment Models
  - Process Professional, Bootstrap
- Training Courses
- Assessor Registration and Certification
- Computer-based Assessment Tools

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Market Transition -2

- Benchmarking Database
- Process Assessment Body of Knowledge
- New Model development
  - Systems Engineering
  - Product-Line Reuse
  - EFQM

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PDTR Review

ISO/IEC 15504 is a preliminary draft technical report (PDTR) in the area of software process assessment.

The first PDTR was released by ISO in November, 1996 for a 3 month ballot ending February 27,1997.

A meeting of ISO/IEC JTC1/SC7/WG10 was held in Singapore on April 7-11, 1997 to dispose of the ballot comments on the PDTR.

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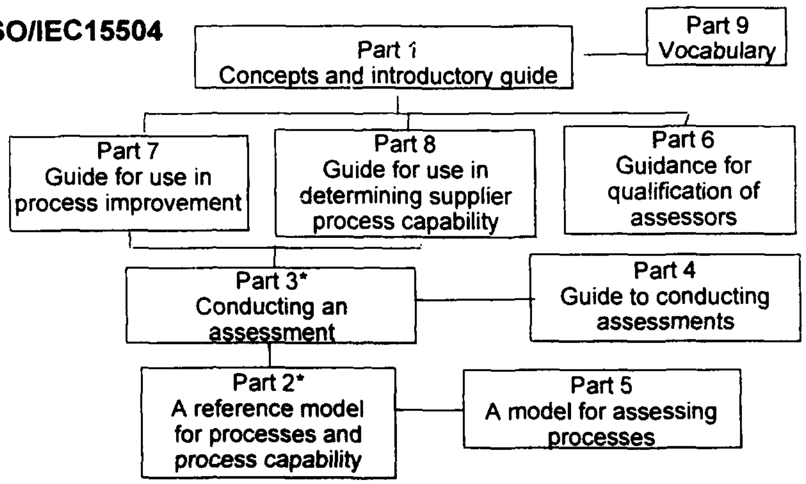
ISO/IEC15504



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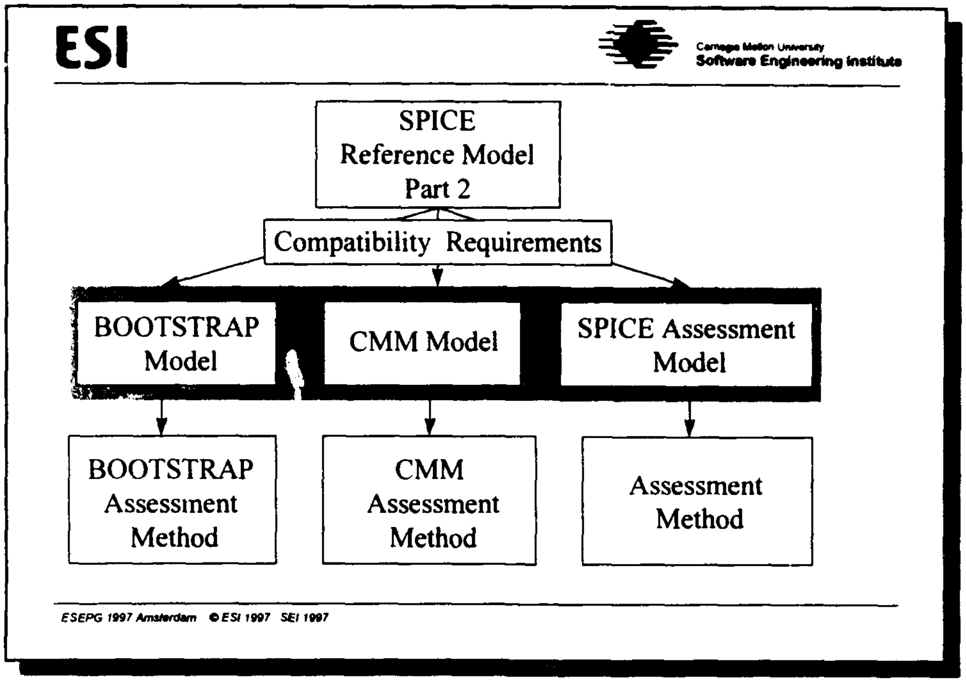
ESI
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SPICE Reference Model Part 2
Compatibility Requirements
BOOTSTRAP Model
CMM Model
SPICE Assessment Model
BOOTSTRAP Assessment Method
CMM Assessment Method
Assessment Method
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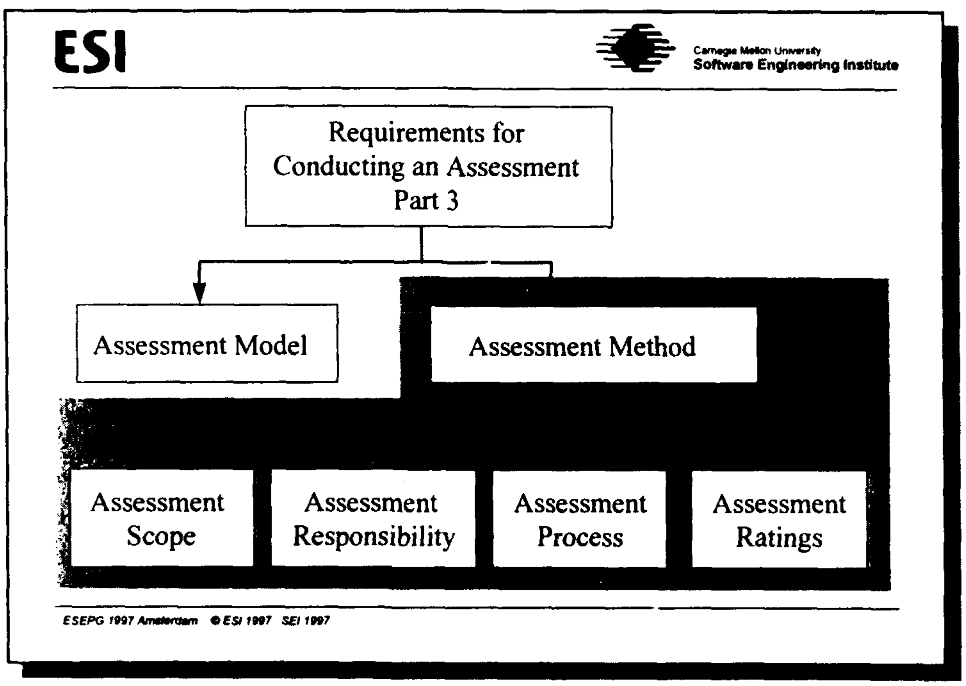
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Requirements for Conducting an Assessment Part 3
Assessment Model
Assessment Method
Assessment Scope
Assessment Responsibility
Assessment Process
Assessment Ratings
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Voting on the 9 documents

The voting for each of the parts, including late votes, was as follows*:

Part 1 17-3	Part 6 16-4
Part 2 14-6	Part 7 17-3
Part 3 14-6	Part 8 17-3
Part 4 15-5	Part 9 17-3
Part 5 13-7	

*-includes 1 vote after comment report

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Key Issues Identified in Ballot Comments

Relationship to ISO/IEC 12207 is weak.

Level 4 and 5 attributes are not clearly articulated.

Process attribute scale does not provide a suitable basis for repeatable assessments.

Compliance requirements are not clear.

Overall size of the document set is too large.

Certification/registration intent of 15504 is not clear.

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Key Agreements at Singapore meeting

ISO/IEC 12207 was fully embraced as the defining document for software processes.

Clause was added in documents that makes clear that 15504 is not intended for certification.

The project agreed in principle to a broader interpretation of the process instance concept.

Part 3 will now contain requirements for an assessment method.

ESI

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Software Engineering Institute

Other Issues

A proposal was made to restructure the document set.

Size of the document set was dismissed as a non-issue.

Phase 2 trials were extended.

US proposal to limit part 5 to a single example was deferred.

A proposal was made to separate part 5 from the rest of the document set.

ESI

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Software Engineering Institute

Areas of Continuing Concern

The role of part 5 (exemplar model) in the product set is a contentious issue.

Certification/registration of methods, models, and assessors is desired by some.

Ballot progression is unclear.

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PDTR ballot conclusions

Singapore meeting resulted in some key breakthroughs which bode well for the CMM community as well as the global software engineering community and for widespread acceptance of the emerging standard.

However, agreements must be fully implemented in the product set and then subjected to the normal balloting process for full confirmation and acceptance.

ESEPG 1997 Amsterdam ©ESI 1997 SEI 1997

ESI

Carnegie Mellon University
Software Engineering Institute

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SIEMENS ZT SW 3

Assessment and Optimization of System Architectures
Experiences with Industrial Applications at Siemens

Dr. Michael Gloger, Dr. Stefan Jockusch, Norbert Weber
Siemens AG
Technology Group
Munich

SAA - System Architecture Analysis

1

SIEMENS ZT SW 3

The Role of Architectures for SW-Development

- **a good architecture is an essential precondition for market success**
  - major characteristics of a system are determined by its architecture
    - efficiency, changeability, reliability, ...
- ***principle design decisions are made in various engineering scenarios, e.g.***
  - *in the early phases of development projects:* balancing market needs and technical possibilities
  - for harmonizing architectures of different products in order to re-use common components
  - to adopt a system architecture to distributed development
- **today architecture defintion and evolution is an ad hoc process**
  - no systematic analysis of alternative solutions
  - no regular assessment and optimization of architectures
  - no active and controlled evolution of architectures

SAA - System Architecture Analysis

2

System Architecture Analysis (SAA) Goals

- **Supply method for analyzing and optimizing architectures**
  - Verify design decisions
  - Identify optimization potential
- **Objective decisions**
  - Structure decision space
  - Direct comparison of competing design decision
- **Effective communication**
  - Describe architecture without usage of special notation
  - Concise description of pros and cons of competing solutions

Characteristics of SAA

- **Considers all relevant perspectives:**
  - Technological/engineering view
  - Customer and market demands
  - Organization requirements (Time, Costs, ...)
  - Quality criteria
- **Indicates to which degree an architecture fulfills the criteria**
- **Identifies possible optimizations**
  - based on evaluation of alternative solutions
  - with consideration of resulting benefit
- **Involves experts from Development, Marketing, Sales, Service**
  - to guarantee acceptance and internal communication of results

SIEMENS ZT SW 3

Example: Assessment of Architecture Framework for Multimedia Communication System

Situation
- Dynamic and rapidly expanding telecommunication industry
- New competitors
- Very early development stage
- Framework developed by cross-functional, geographically distributed team

Requirements
- Flexibility and scalability w/r to capacity and features
- Integration of existing PBX
- Supply open standardized interfaces
- Cooperate with LAN/PC world

Goals of Assessment
- ⇨ Is the concept suited to meet all these requirements?
- ⇨ What are the possible optimizations, open issues and risks?

SAA - System Architecture Analysis

5

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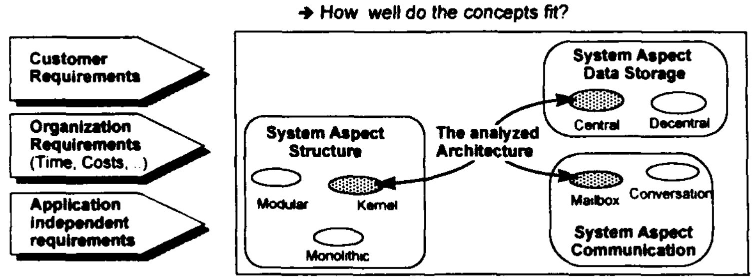
System Architecture Analysis (SAA) Overview

Evaluation Criteria
- based on all requirements

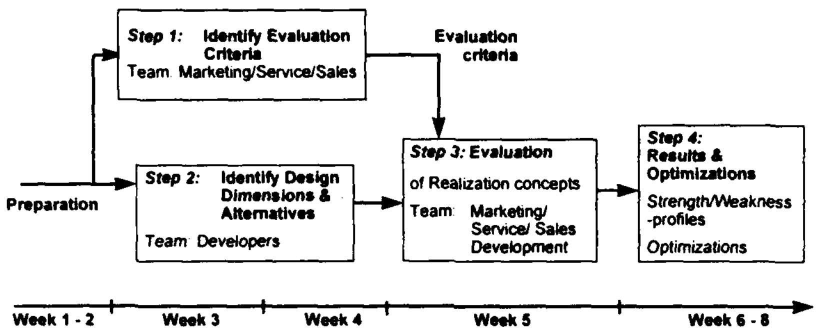
Architecture
- Investigation focuses on **system aspects** and **realization concepts** for these system aspects
  - ➔ How well is each realization concept suited to fulfill each of the requirements?
  - ➔ How *well do the concepts fit?*



SAA - System Architecture Analysis

6

System Architecture Analysis (SAA) Procedure



Step 1: Structure and priorize requirements

Procedure

- 2 to 3 workshops with experts from marketing, sales, service, and development
- Identification, hierarchical organization and prioritization of requirements

Results

- ⇨ Hierarchy of requirements from organization, market, customers and development
- ⇨ One hierarchy level becomes set of evaluation criteria (about 30)
- ⇨ Weights for criteria

> **➢ Goal: reach consensus about the priority of requirements**
> **➢ Prioritization of requirements is an essential precondition for deriving a representative set of evaluation criteria from requirements**

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ZT SW 3

Step 2: Identify system aspects and realization concepts

Procedure

- 2 to 4 workshops with developers and system architects
- Build description of architecture in terms of underlying design decisions and chosen realization concept
- Find alternative realization concepts for each system aspect

Results

- ⇨ Set of about 20 basic system aspects (design dimensions)
- ⇨ 2 to 5 alternative realizations for each
- ⇨ ***Common understanding*** *of each* system aspect and realization

> **Design space supports abstract and concise view of architecture concepts**
> **Many design decisions are "unconscious": no documentation, but accepted by all involved experts**
> **Design space concept inspires formulation of completely new solutions**

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ZT SW 3

Step 3: Evaluation

Procedure

- 2 workshops with developers, system architects, and experts from marketing, sales and service
- Detailed evaluation of two aspects
  - How well is each realization concept suited to fulfill each requirement?
  - How well do realization concepts fit?

Results

- ⇨ Evaluation of each realization with respect to each criterion and of each realization with each other

> **"Localized evaluation" (one concept, one criterion) supports efficient evaluation procedure**
> **Tradeoffs become transparent and conscious**
> **Discovery of interactions and implications which were overseen**

SAA - System Architecture Analysis

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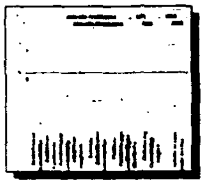
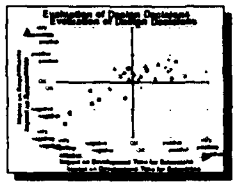
Step 4: Optimization

Strength/weakness profile



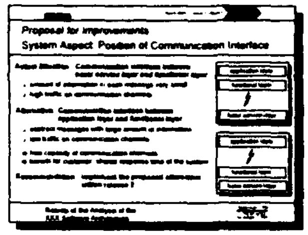
- To which degree does the architecture meet the requirements?
- Which requirements are being supported only badly?

Evaluation of design decisions



- How have the realization concepts been evaluated regarding special criteria?
- Which realization concepts have to be improved?

Optimization measures



- How can the architecture be improved?
- What does the strength/weakness profile of the improved architecture look like?

Assessment of MM system architecture: Results

Evaluation of the architecture

- Precise judgement on **suitability of the architecture** for fulfilling the requirements based on strength-weakness profile
- Identification of "**design tradeoffs**". Example:
  - *Conflict* "standards vs. distinctive features"
- Identification of **open or unspecified design decisions**

Optimizations

- Improved software layering structure in order to optimize both **performance** and **encapsulation of low level functions**

Further benefits

- Representation supplies **transparency** to experts and is suited for **communication to management**

SIEMENS ZT SW 3

Application within different scenarios, Example 1
Harmonization of Architectures

Situation

- Several systems of an application domain have been developed independently
- Similar components are developed and maintained several times
- Re-use of components is hindered: no standardized interfaces, different software plattforms

Goal

- Reduce development time and effort by re-using common components
- Standardize platform, architecture and interfaces
- Homogenous user interface
- Transparent basis for decision making: demonstrate benefits

Challenge: Effort spent for architecture harmonization must be balanced to expected benefits

⇨ Common architecture must be suitable to meet future requirements

⇨ Architecture must be able to incorporate new and upcoming technologies

SAA - System Architecture Analysis

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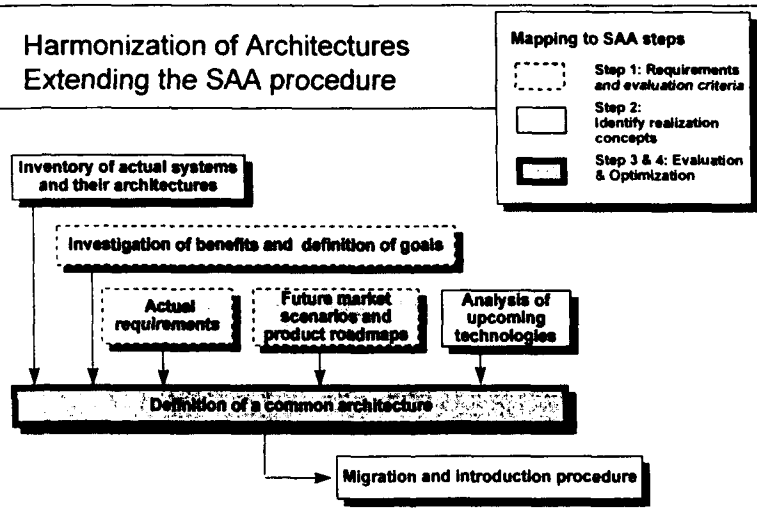
Harmonization of Architectures
Extending the SAA procedure



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Application within different scenarios, Example 2
Adapting architecture and process to distributed development

Situation

- First product developed for local market with small number of customers
  - Small centralized development site
- Challenge: globally expanding market, increasing number of customers
  - Communication overhead for clarification of requirements
  - Several product variants required for different markets

⇩

Goal: globally distributed software development

- Several distributed development sites: short cycle time for customer segment specific features
- One development site responsible for common components and platform

SAA - System Architecture Analysis

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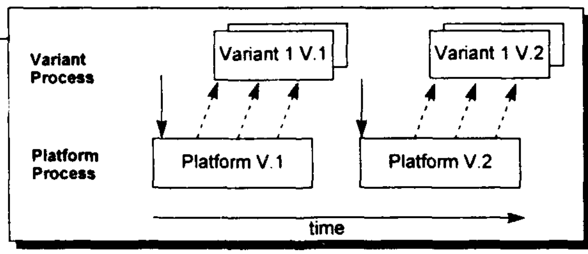
Adapting architecture and process to distributed development



Solution

- Restructuring of the development process
  - Splitting the platform process from variant process
  - Synchronization points for stabilizing the overall architecture using SAA
- Restructuring of the architecture
  - Definition of common components
  - Interface to variant parts

SAA - System Architecture Analysis

16

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Summary and next steps

- **SAA is suited for a variety of application domains**
  - Medical Systems, Automation, Communication
- **SAA can be adapted to different engineering scenarios**
  - Architecture definition, restructuring projects, architecture harmonization
- **SAA improves communication between involved functions**
  - Communication and negotiation between functional areas (Marketing, Sales, Service)
  - Compact documentation of design decisions
  - Objective decision making
- **Satisfactory results achieved with qualitative judgements**
  - SAA well suited for early phases of architecture definition
- **Future focus: procedures and organizational implications for architectural design**

SAA - System Architecture Analysis

 17

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Ongoing Research

- **Organization and procedures for development of architectures**
- **Procedural model for architecture definition**
  - Architecture platforms for families of products for an application domain
  - Common component definition based on reference architectures
- **Documentation of architectures**
  - focused on supporting communication between different functional areas
- **Metrics for Architectures**

SAA - System Architecture Analysis

 18

SEPG June 97 - SAT/1

Understanding and Improving Your Suppliers

Chris Amos and Mick Bennett

Software Supplier Assessment Team

BT

SEPG June 97 - SAT/2

Summary

The practical adaptation and enhancement by BT's Software Supplier Assessment Team of existing methods and models for understanding and improving our Suppliers.

BT

SEPG June 97 - SAT/3

Why BT Need To Assess Suppliers

- We are totally dependent upon software for our commercial survival
- We have some of the world's biggest programmes.

BT

SEPG June 97 - SAT/4

The Track Record Is Not Good

- **80%** of projects are delivered late and over budget
- **40%** of systems fail or are abandoned
- **only 10-20%** of systems meet **all** of their success criteria
- failures are rarely purely technical in origin

BT

The performance of Information Technology and the role of human and organizational factors.
Institute of Work Psychology, Sheffield University - January 1996

SEPG June 97 - SAT/5

The Track Record Is Not Good

- 51% do not use effective project management
- 77% do not have a tried and tested method of estimation
- 63% do not adhere to any recognised quality standards

BT

Ref: IPL Survey 1991

SEPG June 97 - SAT/6

Supplier Assessment In BT

- We use two different methods at present:
  - The Healthcheck for **internal** suppliers only and
  - Software Supplier Assessment (SSA) for **internal** and **external** suppliers
- Less formal 'project firefighting' reviews and assessments

BT

SEPC June 97 - SAT/7

What's in it for BT?

- A better understanding of BT's Supplier base
- More manageable risks to BT through better project preparation
- Less 'troubleshooting'
- Tender adjudication speeded
- More objective Supplier selection
- More appropriate contracts
- 'BT lessons' fed back for internal improvement

BT

SEPC June 97 - SAT/8

What's in it for our Suppliers?

- 'Free' consultancy based around the group's extensive experience
- A catalyst for improvement within the Supplier
- A better understanding of BT's needs, concerns and expectations
- An opportunity to raise issues with BT
- Increased visibility within BT

BT

SEPG June 97 - SAT/9

Software Supplier Assessment Team

- Team of specialists first formed in 1990
- Multi-disciplinary
- Providing a portfolio of services

BT

SEPG June 97 - SAT/10

Assessment History #1

- Started with proprietary 'best practice' audit technique
- Operated for two years
- Problems :
  - Too large
  - Audit
  - Proprietary

BT

Assessment History #2

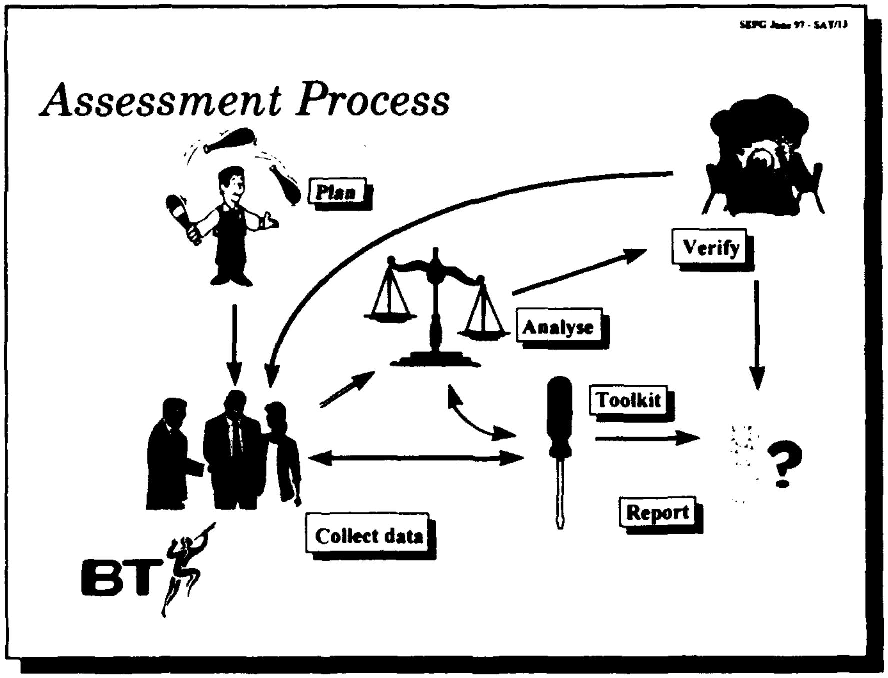
- The solution is SSA:
  - An assessment rather than audit approach
  - Method gives re-use of supplier data, flexible, scaleable and tailorable assessments
  - Model based on CMM which gave Best Practice, good training material, staged levels and focus
  - However Model expanded to fully address BT's needs

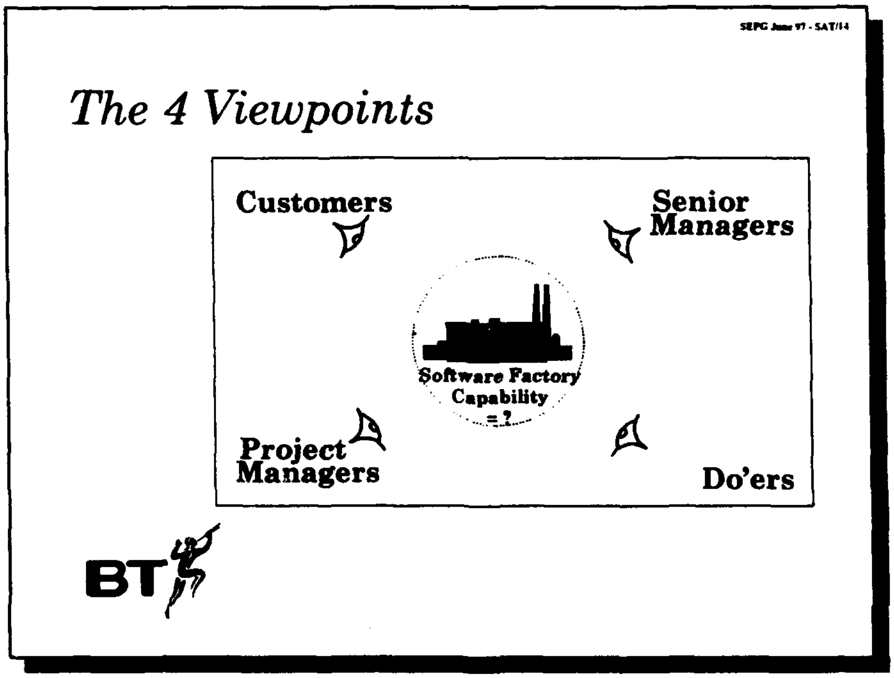
BT

SSA Ethos

- It is an ***assessment***, <u>not</u> an audit
- All data collected will be visible ***only to the assessment team***
- All feedback/information is ***non-attributable*** to individuals
- To be of any real benefit, there needs to be an ***open and honest*** flow of information
- We need the ***support*** of the Supplier's Senior Management

BT


SEPG June 97 - SAT/13
Assessment Process
Plan
Verify
Analyse
Toolkit
?
Report
Collect data
BT


SEPG June 97 - SAT/14
The 4 Viewpoints
Customers
Senior Managers
Software Factory Capability = ?
Project Managers
Do'ers
BT

Tools

- Process description and guidelines
- Database
- Questionnaires
- Checklists
- Spreadsheets
- Project Management

BT

Tools - Questionnaire

- Use pre on-site visit to focus assessment
- SSA initially used CMM Questionnaire

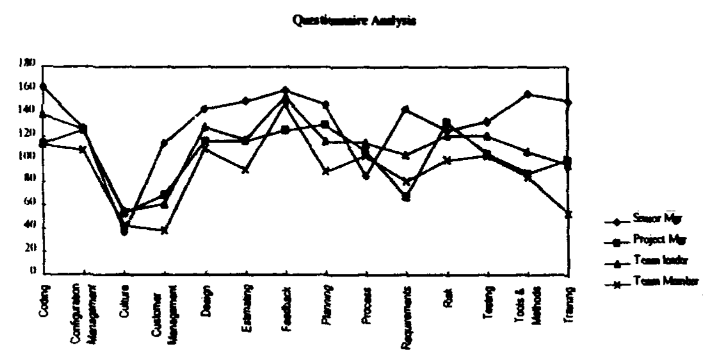
BT

Tools - Questionnaire

- SSA currently uses:
  - STARTS-based questionnaire - 4 pages, 50 questions, 20 minutes
  - Larger sample (typically 35+)
  - Completed by all levels
  - Not process bound - gives 'cultural feel'
  - Statement based with Strongly Agree to Strongly Disagree scale

BT

Tools - Questionnaire



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Capability - the 3 P's

Capability = Process + People + Performance

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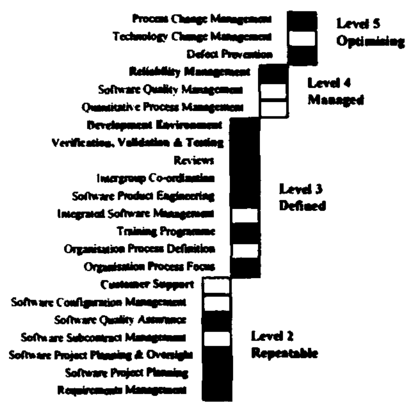
Process Rating

Key

- Non Compliant
- Partially Compliant
- Largely Compliant
- Fully Compliant
- Process not assessed

BT extra KPA's



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SEPC June 97 - SAT/21

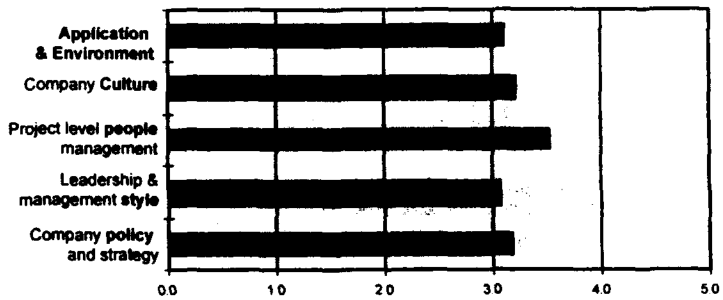
Capability Score - People

- An indicator of the quality of the supplier's software development people and their ability to 'do the job'
- The rating profiles:
  - Company policy & strategy
  - Leadership & management style
  - Project level people management
  - Company culture
  - Application and Environment

BT

SEPC June 97 - SAT/22

People Scoring



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Capability Score - Performance

- An indicator of the supplier's ability to develop and deliver quality software rich systems
- The rating profiles:
  - Pre-contract performance
  - In-contract performance
  - Post-contract performance

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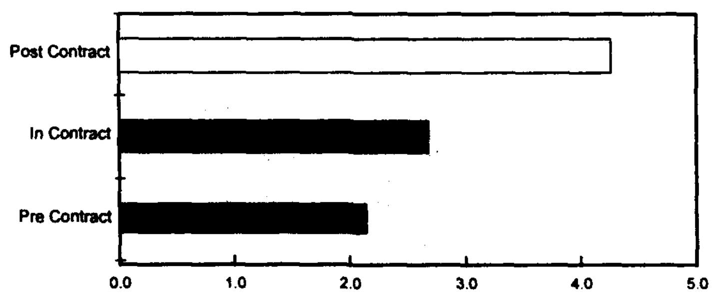
Performance Scoring



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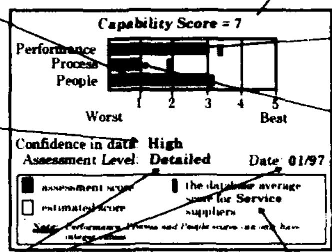
Current Perception

Capability Score is the sum of the Performance, Process and People scores. The maximum score is 15 and a High Score should equate to Low Risk

The people score has been assessed as 3, the average is 3.1



Performance score is 3, the average is 3.4

A statement is made regarding the confidence we have in the accuracy of the data. Values are High, Medium and Low

Process score is 1, the average score is 1.9.

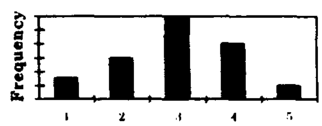
A detailed supplier assessment was carried out in January 1997.

To calculate averages, suppliers have been grouped as supplying Products (e.g. switches, etc.) or Services (i.e. Outsourcing and Sub-contracting).

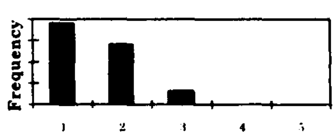
BT

Distributions

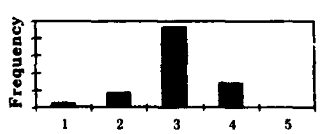
Capability Score



Performance Score



Process Score



People Score

BT

SEPG June 97 - SAT/27

Where To Now?

- Evolve Model, Method and Toolset
- Migrate from CMM to become SPICE compliant
- Increase effectiveness of People and Performance elements
- Increase (broaden) use of Supplier Assessments within BT

BT

SEPG June 97 - SAT/28

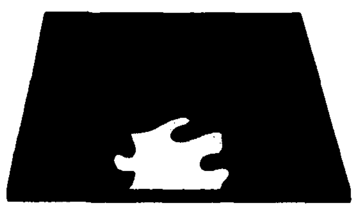
Software Quality

- Implementing and Enhancing a Quality Management System using Total Quality Management Principles and the Capability Maturity Model as a Framework
- Based on Practical Experience (1992-97)

PanCredit

Objectives

- Share my Experiences
- Provident
  - In-House Development
- PanCredit
  - Software House
- An Approach that Works



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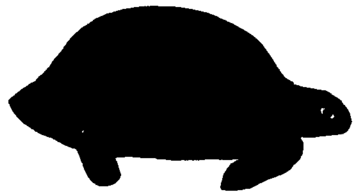
Branch Info. System

- 200 Branches
- Unsecured Loans
- Domination of Mkt (60%)
- In-House Development
- 60 Staff
- Mentality to Develop Everything
- Emphasis on Selecting Cheapest Solution



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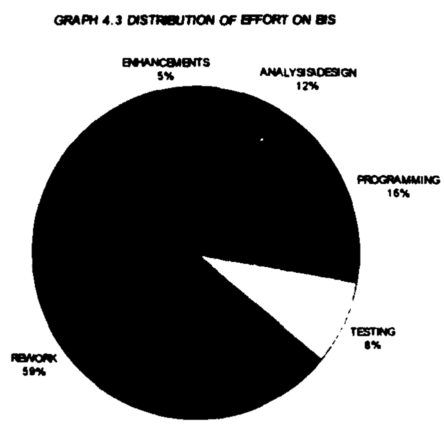
3

Effort on B.I.S.



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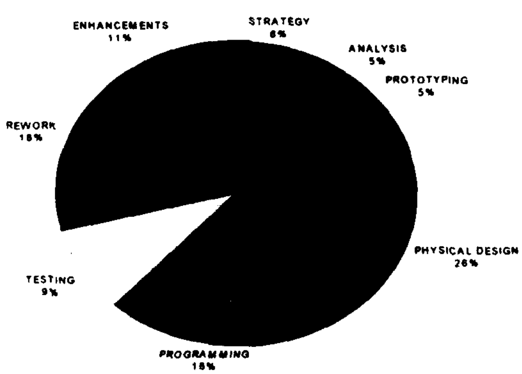
4

Reasons

- Unplanned Commitments
- Poor Requirements Capture
- Problems of Scale
- Culture of Fear
- Gurus
- Silver Bullet
- No Quality Assurance and Control
- Poor Configuration Mgt.

Effort on C.D.

GRAPH 4.4 DISTRIBUTION OF EFFORT ON CD



Process Improvements

- Methods
- Project Management
- Change Control
- Process Improvement Teams
- Culture Change
- Quality Assurance
- Configuration Mgt.

Re-Work

PROJECT	PROJECT DEVELOPMENT (WEEKS)	PROJECT RE-WORK (WEEKS)
BIS	840	1356
CD	948	240

Key Comparisons

- Re-Work (60% to 18%)
- Effort before Build
  - (12% to 44%)
- Enhancement
  - (1.5 yrs to .25 yrs)
- Requirements Capture
- Management of Scale
  - Staff
  - Programs

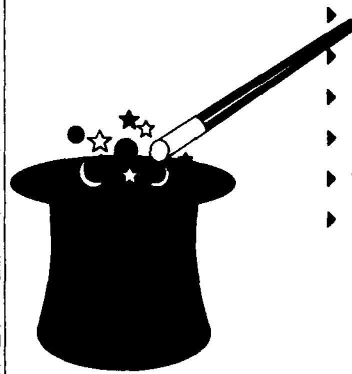
PanCredit

Return On Investment

- Crosby Model
  - Do It (Performance)
  - Test It (Appraisal)
  - Review It (Prevention)
  - Fix It (Re-work)
- Cost of Improvements approx. 500 days
- Reduced Re-work approx. 5,000 days
- R.O.I = 1:10

PanCredit

Who Are PanCredit?

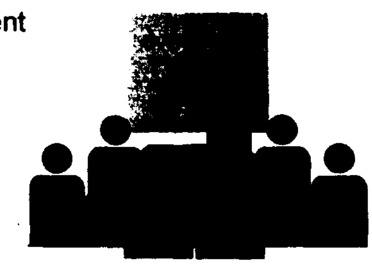


- S.M.B.E - £5m T/O
- Software House
- Financial Lending Systems
- 120 Staff
- Outskirts of Leeds
- V, OO Methodologies
- Oracle\G.U.I

PanCredit

Foundations - T.Q.M

- Customer Requirements
- Prevention not Detection
- Continuous Improvement
- Leadership/Culture
- Teamwork
- Process Control



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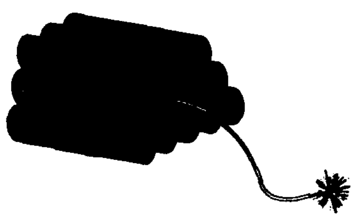
Approach

- Management Commitment
- Assess Effectiveness
- Identify Objectives
- Determine Strategy
- Determine Resources
- Select Methods\Tools
- Educate, Implement and Evaluate

Mgt. Commitment

- Use Crosby's Model
- Gather Data
- Present Status
- Frighten the Help Out of Everyone
- 60-80% Re-Work
- Losing Key Customer
- Show Them How to Get Out of the Mess



Assess Effectiveness

- TickIT
  - Desk Study Reports
  - Pre-Assessment
- C.M.M Assessment
  - Questionnaires
  - Results Profile
  - Findings, Action Plan

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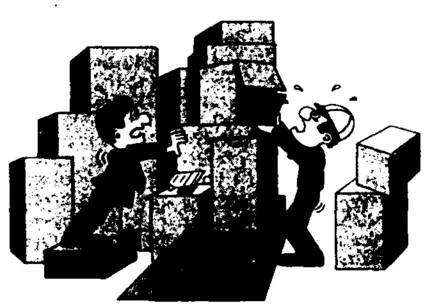
#15

Identify Objectives

- Get Out of Chaos



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#16

Determine Strategy

- Select Framework
  - TickIT
  - C.M.M
- Configuration Mgt.
- Project Mgt.
  - Estimating
  - Risk
  - Planning and Control
- Quality Management
  - QC and QA

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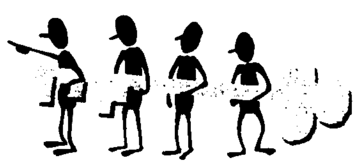
17

Determine Resources

- Management Responsibility
- Quality Assurance
  - Peers
- Process Improvement Group
  - Life Cycle
- Quality Circle



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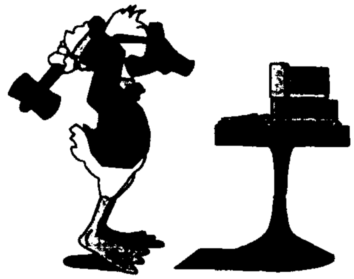
18

Select Methods\Tools

- V, OO
- Project Planning
  - MS-Project
- Resource Planning
  - Spreadsheets
- Configuration Mgt.
  - D.C.S (In-House)
- Fault Management
  - Supp (In-House)
- Select
  - Analysis\Design

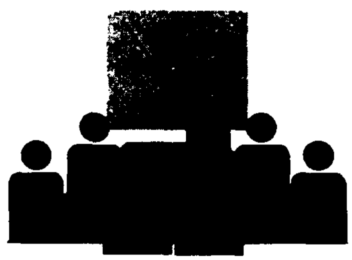


PanCredit

19

Educate, Implement, Evaluate

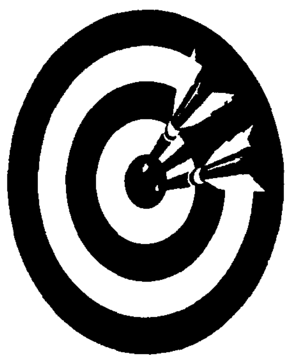
- Education\Training
  - Seminars
  - Walkthroughs
- Evaluation
  - Project Reviews



PanCredit

20

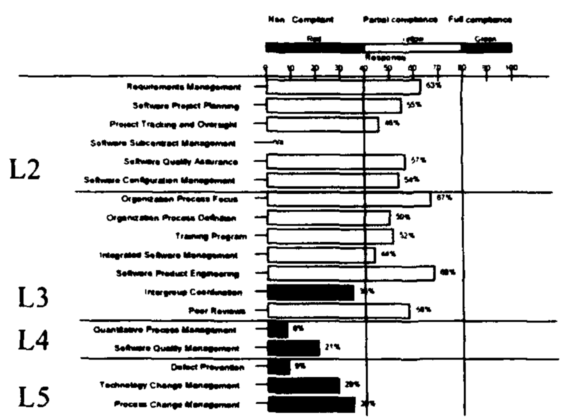
Results



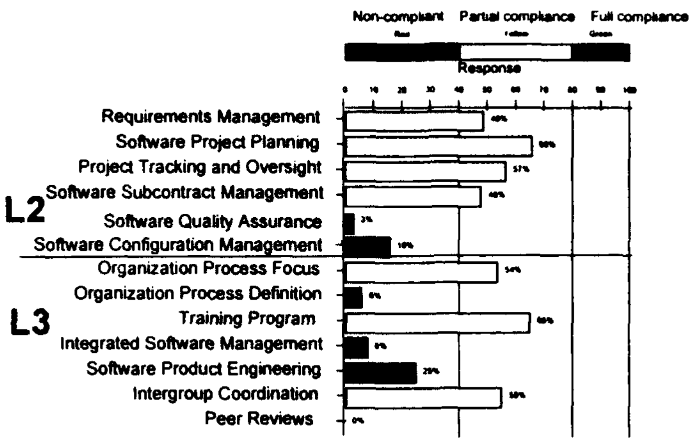
- TickIT
  - Pass
  - 6 Minor Actions
- C.M.M
  - Chaotic
  - Compliance in 11 out of 12 Relevant Key Performance Areas
  - Good in Comparison

CMM Assessment Findings

PROJECT: **CMM Level 2, 3, 4 and 5**



Typical Profile



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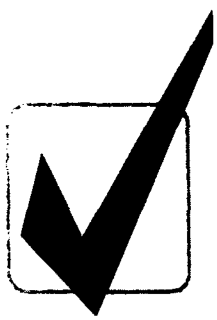
Results

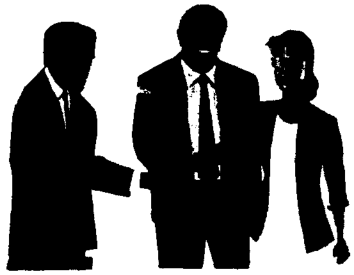


- Customer (30% re-Work)
  - Implementation Issues
- D.C.S (1.2)
  - No Major Faults after Implementation
- Independent Q.A of O.O Process - no Major Issues

PanCredit

Key Success Factors

- Management Commitment
- T.Q.M Principles
- TickIT and C.M.M as Framework



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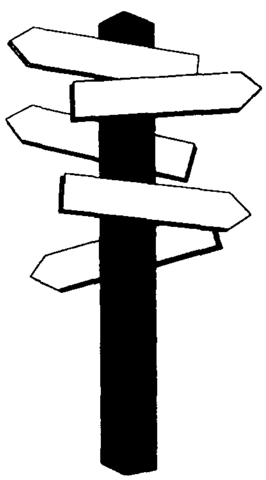
Key Challenges

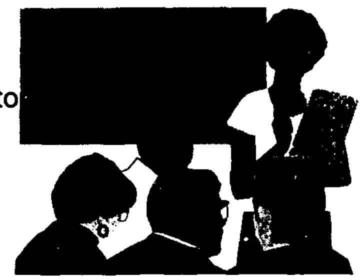


- Leadership
  - Delivery vs Quality
- Teamwork
- People Affairs
- Customer Pressure
- Over Commitment

26

Summary

- Experiences
- Provident
- PanCredit
- Approach
- Key Success Facto



PanCredit

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THURSDAY 19TH JUNE

Introduction

Chris Larner, Head of Development Process Improvement for the Lloyds TSB Group, will introduce the Morning's opening speakers.

Time	OPENING SPEAKERS	
09.00	**Co-Chair**: Chris Larner, Lloyds TSB Group & Bill Peterson, SEI	C401
09.10	**SEI Process 2000: Building on Strength** Steve Cross, SEI	C402
09.50	**The Improvement Engine of the Ericsson Systems Software Initiative** Jorma Mobrin & Anders Wästerlid, Ericsson	C403
10.30	Break	

Time	Keynotes - Track A	Keynotes - Track B
11.00	C404a **SPI Journey from Level 1 to Level 5** John Vu, The Boeing Company	C404b **Highlights and Report Back from The Measurement Symposium** Paul Goodman, TBL
11.45	C405a **A Quarter Century of Software Process Improvement** Terry R. Snyder, Hughes Aircraft Company	C405b **Continuous Quality Improvement in Software Development on the Basis of Measurement and Assessment** Holger Günther, Allianz Life
12.30	LUNCH	

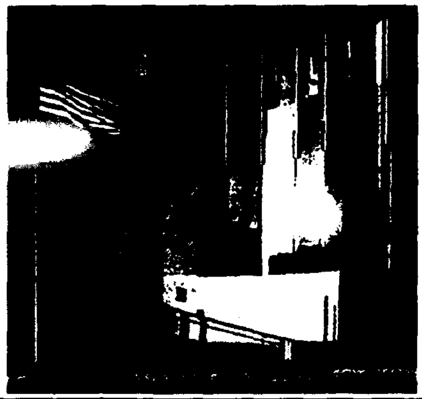
Time	Track A	Track B	Track C
14.00	C406a **Overcoming Resistance to Change to Become a True 'Learning Organisation'** Alistair Watters, Warwick Consulting Ltd	C406b **A Co-ordinated Approach to Identifying Software Development Risk in MoD Projects** Llewelyn Jones, MoD & John Hamilton, DERA	C406c **Five Years' Experience with SPI: Lessons Learnt** Gilles des Rochettes, Thomson-CSF
14.45	C407a **From Chaos to Control** Debbie Hellmann & Alf Pilgrim, Digital	C407b **The Complementary Aspects of Process Capability and Re-Use Capability** Sergio Bandinelli & Álvaro Sanz Monasterio, European Software Institute	C407c **Software Best Practice: Benefits to the Business** Alejandro Moya, European Commission
15.30	Break		
16.00	C408 **PANEL** - Chaired by Colin Tully, Colin Tully Associates Panellists: Bill Peterson, SEI; Chris Larner, Lloyds TSB Group; Hans-Jürgen Kugler, ESI; Keith Jackson, TBL; Alejandro Moya, European Commission; Hans Sassenburg, Netherlands SPIN (SPIder)		
17.00	CLOSE		

Carnegie Mellon University
Software Engineering Institute

SEI Process 2000: Building on Strength

Stephen E. Cross
Software Engineering Institute
Carnegie Mellon University
Pittsburgh, Pennsylvania

Sponsored by the
U.S. Department of Defense



Mission

Provide leadership in advancing the state of the practice of software engineering to improve the quality of systems that depend on software.

2

Outline

SEI overview

Trends impacting software engineering

A vision of the future

Case study (*in the future tense*)

Challenges and opportunities

3

Software Engineering Institute

U.S. Department of Defense (DoD) federally funded research and development center (FFRDC)

College level unit at Carnegie Mellon University (CMU)

Applied research, education, and technology transition programs

4

Software Engineering Handles "Precedented" Systems Well

Precedented systems are characterized by

- **an experienced development team**
- **well defined processes**
- **known requirements**
- **domain experience**
  - **-system**
  - **-architecture**
  - **-technology**

5

Trends in a Rapidly Changing World

Explosive growth and use of the Internet & Intranet

Large companies downsizing and outsourcing

Increase in number of smaller software companies

Rise of the virtual organization

Increasing number of "knowledge workers"

No end in sight to advances in computer speed, memory size, decreased hardware costs, etc. . . .

Age of information appliances and network-centered computing

Demand for software escalating

Surviving in marketplace means first to market

6

Towards a Vision for SWE 2000+

Support higher maturity organizations.

Realize many of these will be virtual organizations operating as Integrated Product Teams (IPTs).

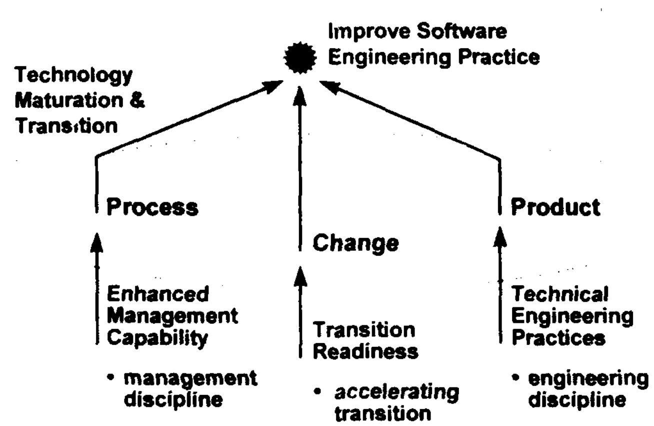
The number of such organizations will increase.

The SWE challenge is to

- **support the definition and design of processes to meet business objectives**
- **respond to user needs at Internet time (three to six month cycles)**
- **provide "finger tip" access to "online, how-to" knowledge**

7

Strategy



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Principal Area Objectives

	Emerging	Strategic	Sustaining
Enhanced Management Capability	Process insight		
Technical Engineering Practices	Product insight		
Transition Readiness	Change facilitation		
	Enabling		

9

Initiatives

	Emerging	Strategic	Sustaining
Enhanced Management Capability		Acquisition Risk Management Personal Software Process	Capability Maturity Modeling
Technical Engineering Practices	Architecture Tradeoff Analysis Dependable Systems Upgrade COTS-Based Systems Product Line Practice	Survivable Systems	
Transition Readiness	Accelerating Software Technology Adoption Process Technology Utilization Software Engineering Measurement & Analysis		
	Enabling		

10

Engineered Software Systems

PRODUCT INSIGHT

Engineering Insight and Discipline

- COTS-Based Systems
- Dependable Systems Upgrade
- Architecture Tradeoff Analysis
- Product Line Practice

PROCESS INSIGHT

Management Insight and Discipline

- Personal Software Process
- Capability Maturity Modeling
- Acquisition Risk Management

Component-based, evolvable product lines, ► built and acquired with predictable and improved cost, schedule, and quality.

- Accelerating Software Technology Adoption
- Software Engineering Measurement & Analysis
- Supporting Collaborative Processes

CONTINUOUS IMPROVEMENT

11

Will the following case study be possible by the year 2001?

12

Press Release

* Amsterdam -- Today, June 19, 2001, the 21st Century Corporation (TFC) announced that it has joined the elite 25% of organizations assessed at or above SEI Maturity Level 4 relative to an integrated reference model based on the Software/People/Integrated Product Development CMMs.

13

Annual Report

* The fiscal year-end 2001 results for TFC were released today, and they reflect the following improved results:
  - Delivery cycle-time reduced 43% AND customer acceptance of new product introductions UP 57%.
  - Field maintenance activity reduced 84% AND customer satisfaction survey results of 99.4%, UP from 88% in 1997.
  - Productivity improvement of 54% AND employee morale index UP 34% to a mean of 9.4 out of 10.

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Annual Report - 2

* The impact on the business bottom line is:
  - more than a doubling of profits
  - 3-for-1 stock split
  - 25% increase in dividend payments
  - 10,000 ECU bonus for all employees

15

Let's Look Inside TFC

* TFC, an adopter of the SEI's major initiatives for several years, has been contacted to renegotiate the contract for a product in its procurement systems product line.
* The product is currently in design stage, having already passed through architecture review. The Integrated Product Team (IPT) is called together for a meeting.

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Subject of Renegotiation

* TFC's customer has had one of its business systems invaded by cyber-thieves.
* Thanks to CERT®, were able to repel invasion.
* TFC's Automated Buying System (ABS) not hit, because the version was in a secure facility (local-area). Concerned that security requirements are inadequate for a broad-based version.
* Bottom line: customer wants to add security requirements to existing contract.

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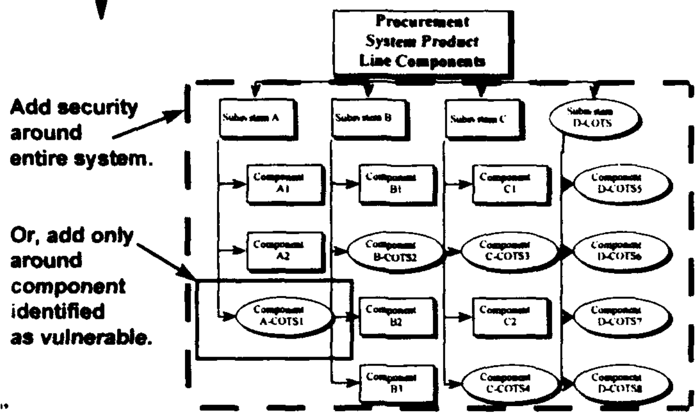
Relevant Requirements

* Security Trust Level X for ABS.
* Zero downtime for security upgrades.
  - customer is a global operation with 24-hour activity on its ABS.
* Minimize additional cost to reach Security Level X.
* No degradation to security level because of geographical distribution of the new system.

18

Architecture Tradeoffs



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Considerations

* How do security enhancements fit with rest of product line?
* What is our process capability, and what are the risks to dependability requirement?
* What improvements are coming that might change current approach/capability?
* What is the interaction between wide-area collaboration, upgrading a system, and maintaining current level of security.

20

Product Line Notes

- Vendor A and TFC discussed opportunities for enhancing security on Vendor A's component before the last architecture revision; prohibitive development cost based on current market potential, productivity/quality rates for new technology additions, and early prototypes caused shelving of the effort.
- TFC has other business system product lines with emerging security issues; one question is whether TFC should start up another product line of security add-ins.

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Process Capability Notes

- PSP/TSP data for entering a new technology area (security) is available for both TFC and its vendors.
- Organizational process capability for the product line accounts for technology enhancement as a risk factor.
- Consideration of a security product line would necessitate piloting a prototype to get some initial productivity baselines to map against the organizational standards for creating a new product line.

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21ST CENTURY CORPORATION

Potential Improvement Notes

* As an SEIR subscriber, TFC has access to online comparison data; industry standards for productivity, quality, and cost by maturity level; business sector/application type; and advanced information on piloting opportunities with the SEI.
* TFC's intranet, based on the SEI's IDEAL℠ repository concept, contains information on TFC initiatives in technology and process improvement, allowing them to access potential internal pilot solicitations.

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21ST CENTURY CORPORATION

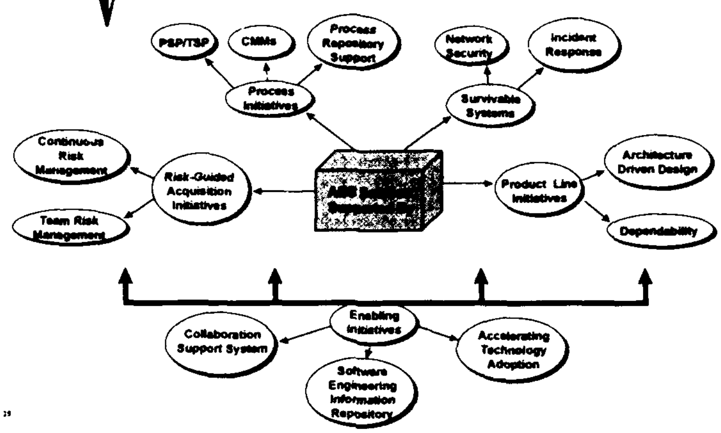
Supporting Collaborative Processes Notes

* A specific approach to wide-area communications and information sharing has already been designed. How will this be affected by the stringent security requirements?
* How does the interaction between the activity during global collaboration and new system synchronization during the system upgrade effect the current processes?
* How will improvements and collaborations be tailored in conducting future business in a global marketplace?

24

21ST CENTURY CORPORATION

Results



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Challenges and Opportunities

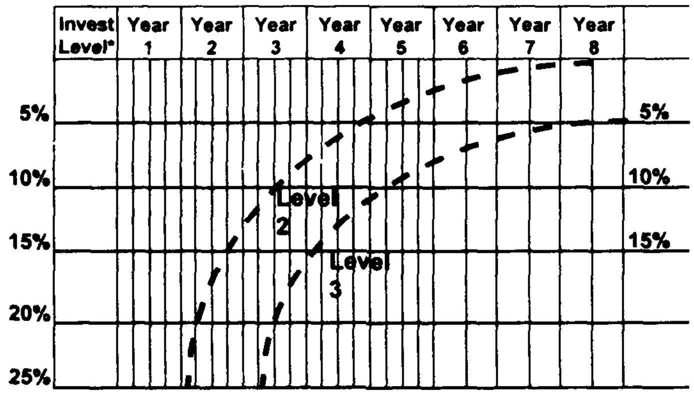
How can we accelerate process improvement?

Can we design processes to meet the business needs of dynamic organizations?

Can we support process definition and improvement *in small companies*? For integrated product teams?

26

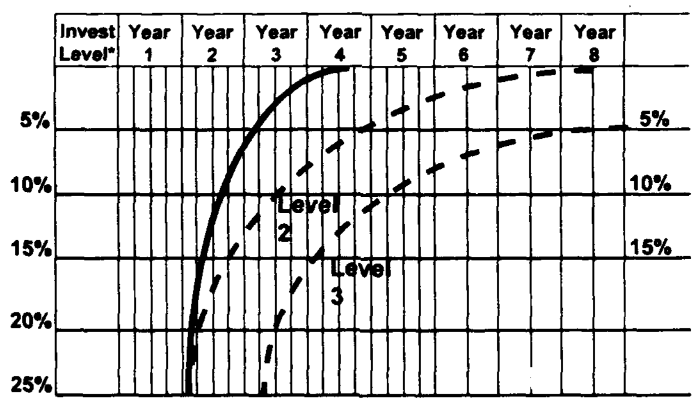
Qualitative CBA-IPI Trends



*Invest Level = % of total software engineering effort

27

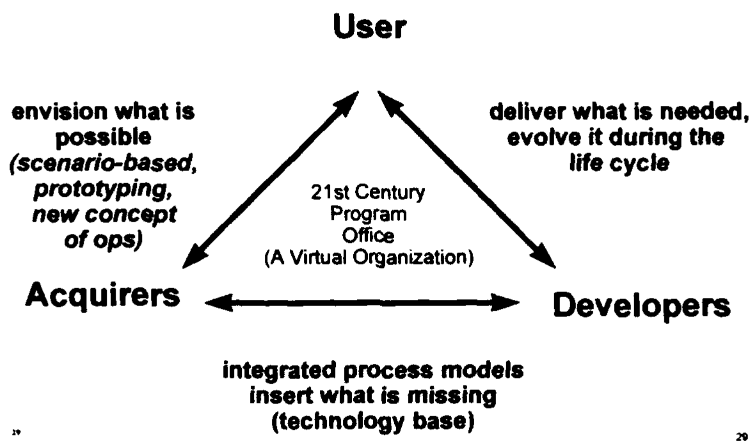
Accelerated SPI



*Invest Level = % of total software engineering effort

28

Basis of a New Process Model



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Summary

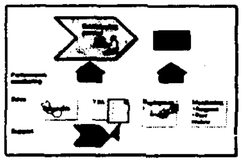
SW-CMM has had a profound impact.

There is a continual need to anticipate and be proactive in a rapidly changing world.

SEI's strategic plan is a basis for the next generation of process improvement.

30

The Improvement Engine of the Ericsson System Software Initiative



Jorma Mobrin
VP Product and System Development

Anders Wästerlid
ESSI programme manager

ERICSSON

Basic facts about Ericsson

- Major telecom system and mobile phone vendor
- Turn over ~16 billion $
- Total R&D spending ~3 billion $
- Present in >100 countries
- 94 000 employees

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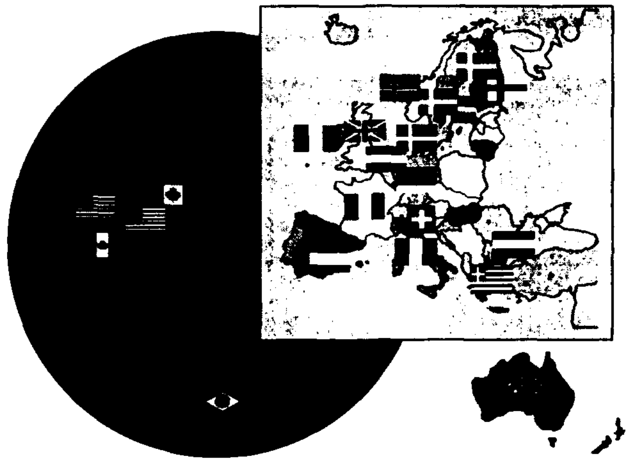
SW design centres in Ericsson



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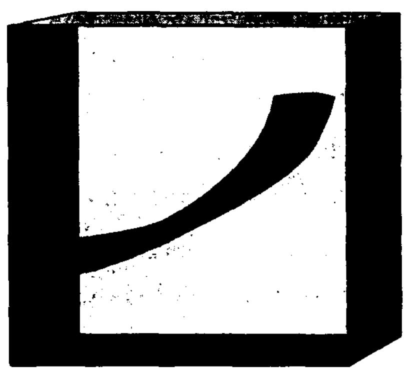
The role of software

Today we spend about 14 billion SEK on SW development and we have more than 10.000 SW engineers

And the importance of SW continues to increase in terms of:

- Fraction of the total development
- Key enabling technology



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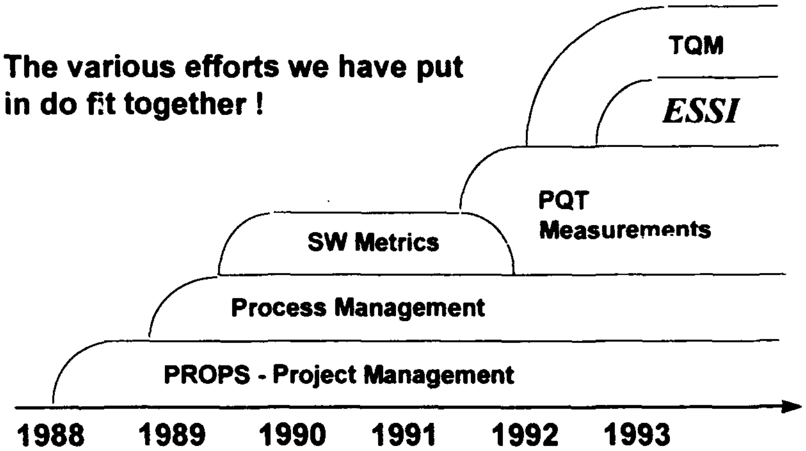
Our History

The various efforts we have put in do fit together !



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ESSI **Purpose:**
improve customer satisfaction and software development efficiency by radical improvement of software quality, lead-time precision and lead-time

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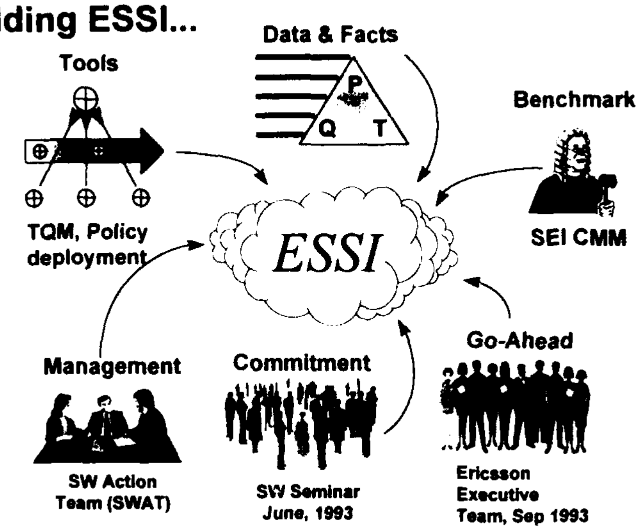
Building ESSI...



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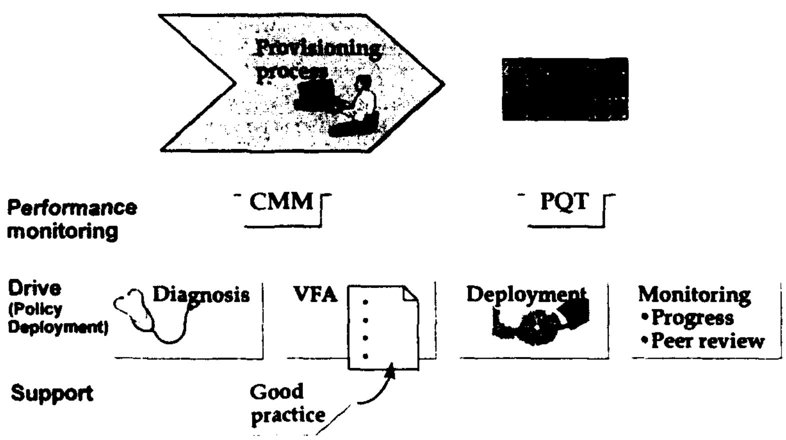
ESSI Improvement Engine



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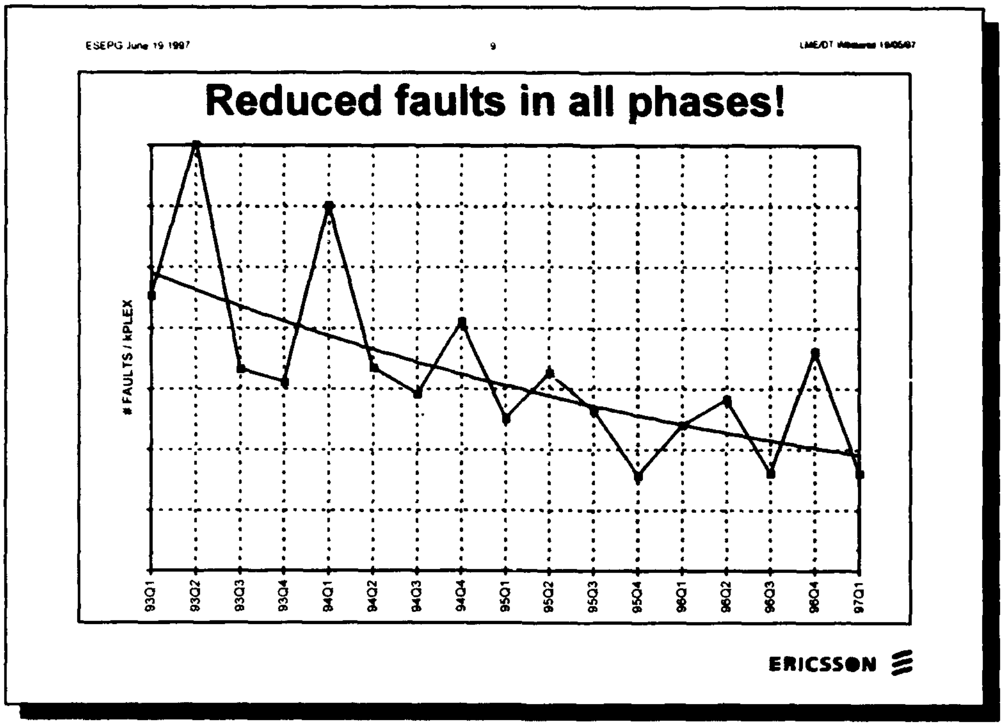
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9
Reduced faults in all phases!
FAULTS / kPLEX
93Q1
93Q2
93Q3
93Q4
94Q1
94Q2
94Q3
94Q4
95Q1
95Q2
95Q3
95Q4
96Q1
96Q2
96Q3
96Q4
97Q1
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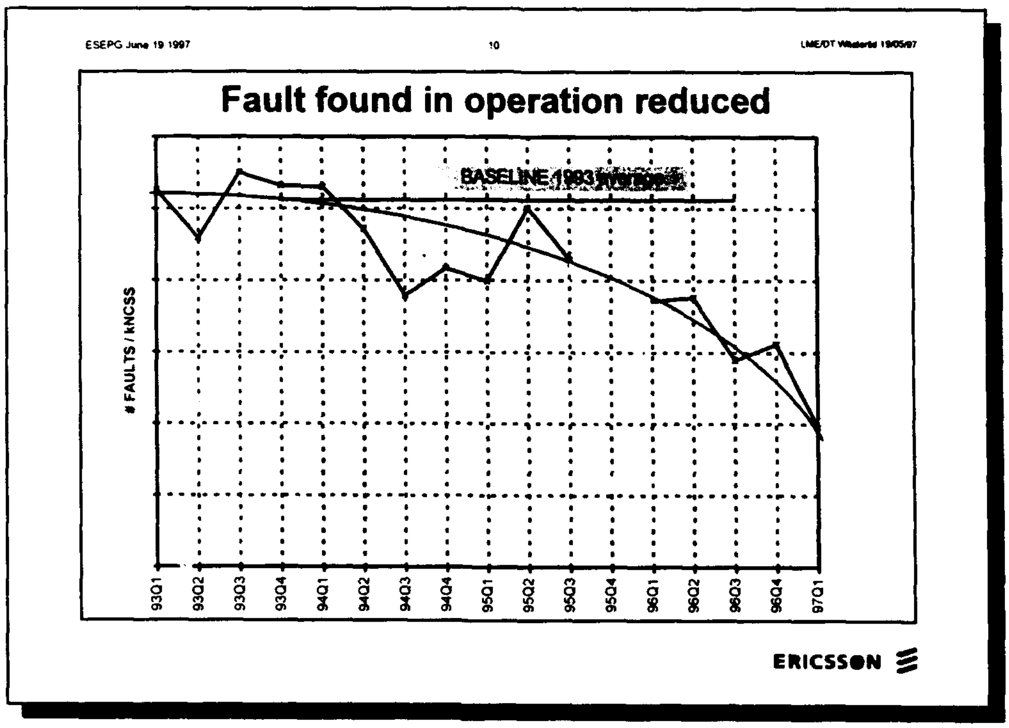
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10
Fault found in operation reduced
BASELINE 1993
FAULTS / kNCSS
93Q1
93Q2
93Q3
93Q4
94Q1
94Q2
94Q3
94Q4
95Q1
95Q2
95Q3
95Q4
96Q1
96Q2
96Q3
96Q4
97Q1
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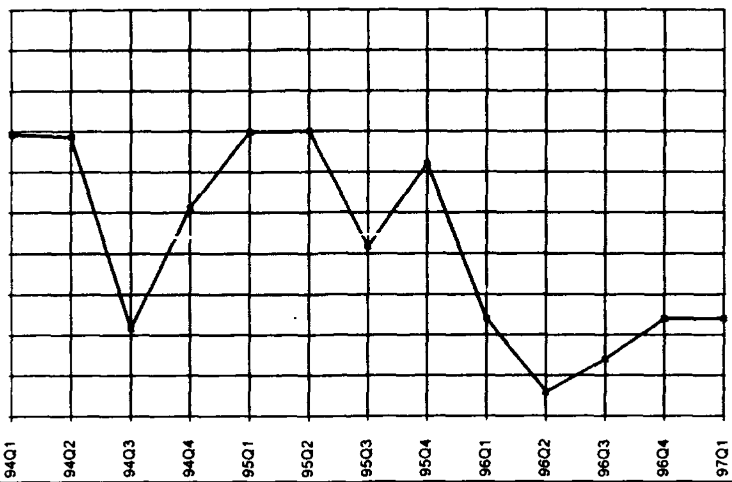
Reduced Delays



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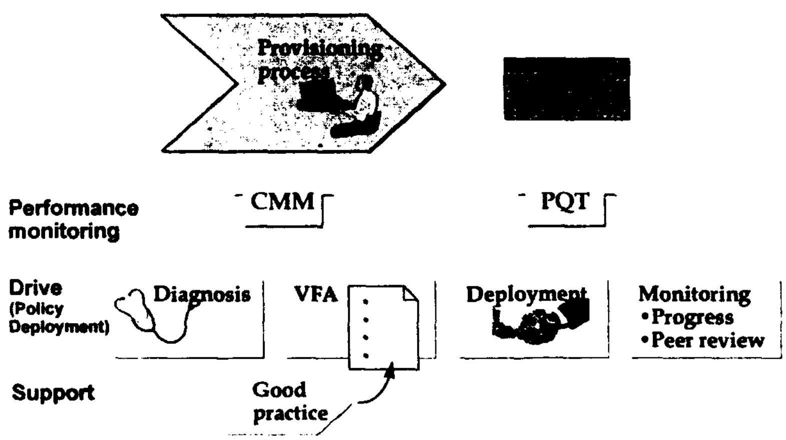
ESSI Improvement Engine



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The use of CMM

In general CMM is used as a tool to achieve performance. It is not as a goal in itself.

Specifically CMM is used to:

- Find areas for improvement
- Set a basic principle for prioritizing improvements
- Follow-up on improvements before results can be measured
- Provide a guideline to an excellent software organisation

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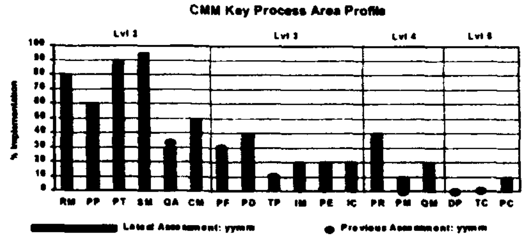
CMM Light & Ultralight

Purpose: get a snapshot of the CMM status

Recommended use:

- *Between full assessments for improvement tracking purposes, eg. quarterly*
- *Prior to full assessment*



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CMM experience

- CMM levels come as a confirmation of improved performance
- All reassessments have yielded a higher CMM level

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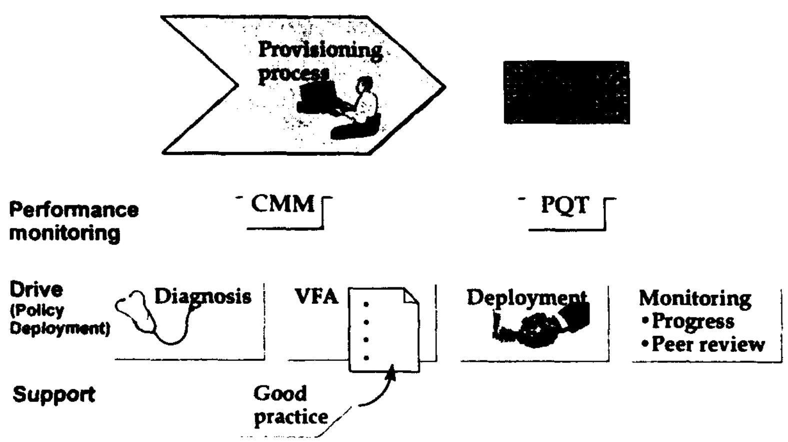
ESSI Improvement Engine



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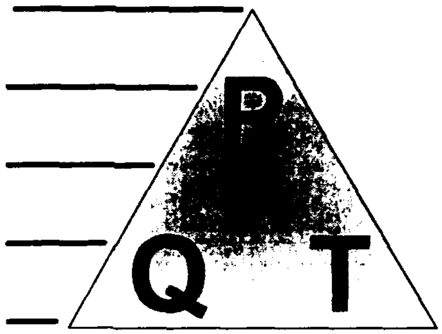
PQT

PQT is the corporate metrics system to monitor performance on:

- Productivity
- Quality
- Time



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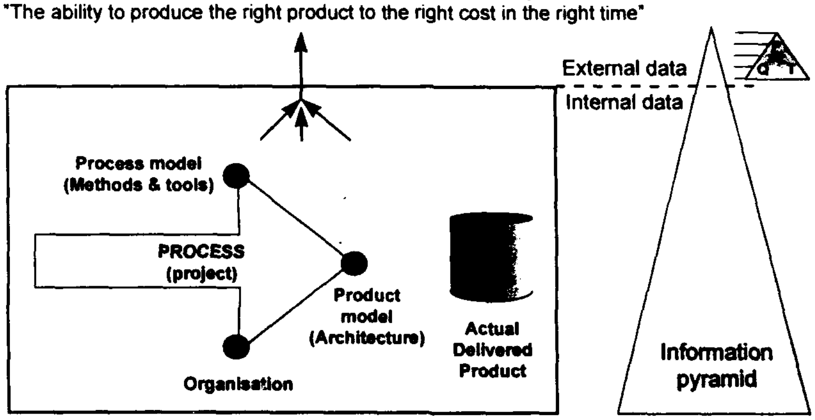
Improvement objective

Target Attributes

Efficiency : Productivity, Time, Cost, Precision, Quality

"The ability to produce the right product to the right cost in the right time"



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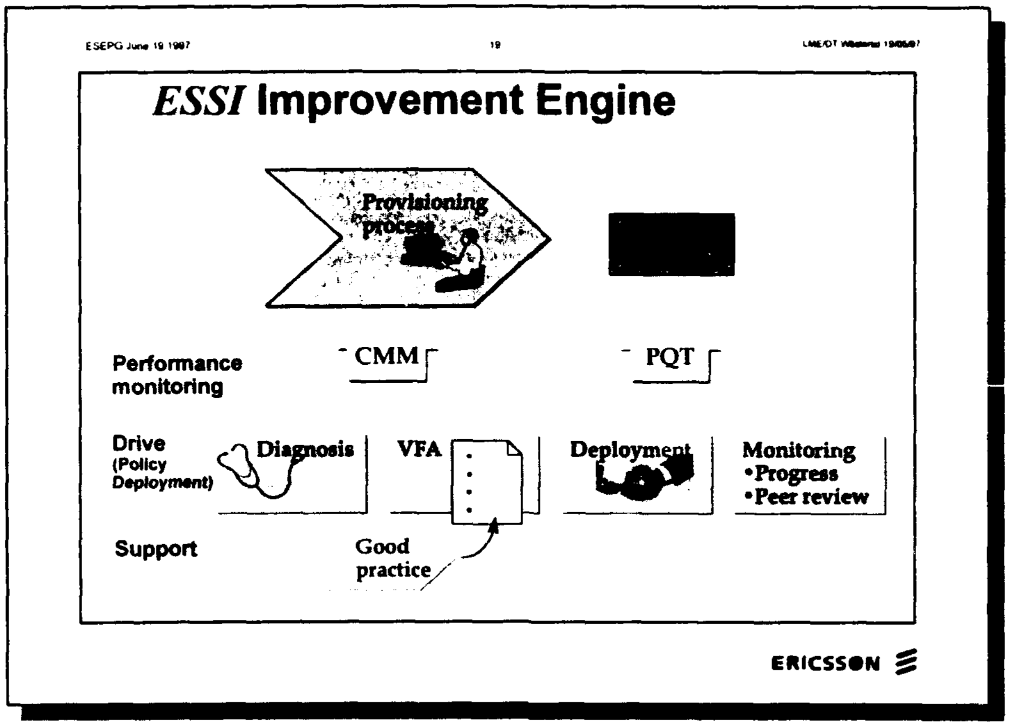
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19
ESSI Improvement Engine
Provisioning process
Performance monitoring
CMM
PQT
Drive (Policy Deployment)
Diagnosis
VFA
Deployment
Monitoring
•Progress
•Peer review
Support
Good practice
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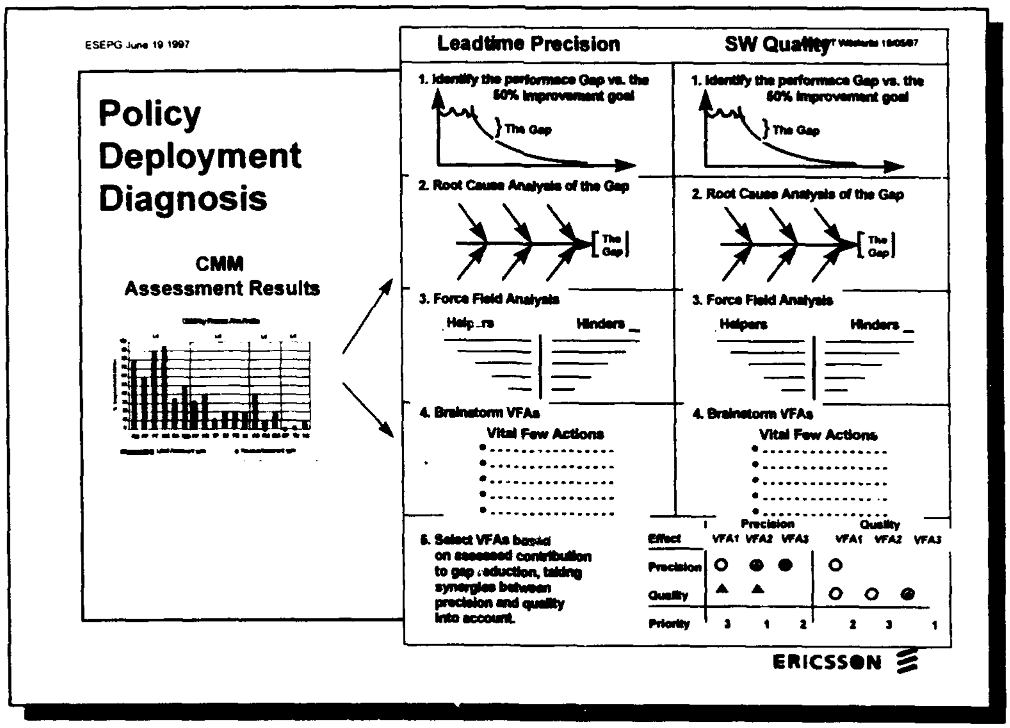
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Policy Deployment Diagnosis
CMM Assessment Results
Leadtime Precision
SW Quality
1. Identify the performace Gap vs. the 50% improvement goal
The Gap
2. Root Cause Analysis of the Gap
The Gap
3. Force Field Analysis
Helpers
Hinders
4. Brainstorm VFAs
Vital Few Actions
5. Select VFAs based on assessed contribution to gap reduction, taking synergies between precision and quality into account.
Effect
Precision
Quality
VFA1 VFA2 VFA3
Priority
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Vital Few Actions

The limited set (3+3) of high leverage actions that will give maximum contribution to improved performance in the short to medium term

Breakthrough Improvement Actions (0-1):
- New organisation
- Re-engineered processes
- New Infrastructure

Continuous Improvement Actions (2-3):
- *Improvements within given infrastructure*
- Moderate process changes

Business as Usual

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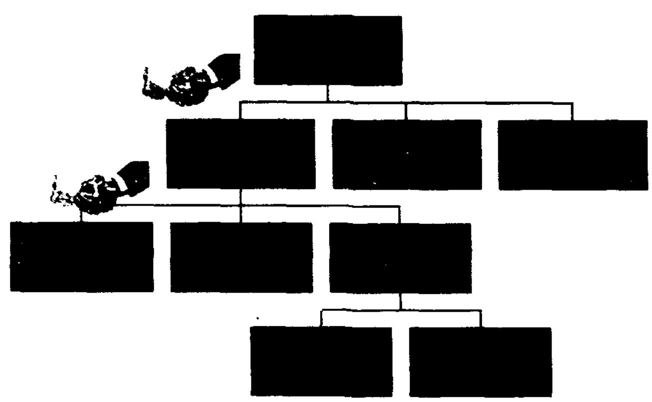
Deployment of VFA



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Monitoring

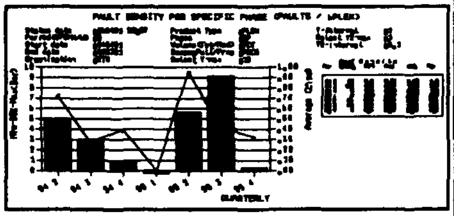
- progress reports
- peer reviews

EXM ESSI progress report Q1 1996

1 SUMMARY

It seems that we now have managed to counter the recent set backs and that our corrective actions are finally paying off. Yet, we have some problems with some of the O&M products that need immediate action.

1 1 QUALITY



The recent trend is promising. Yet, the FT-figures from the AMp9 project was not good. *Some of the O&M product had fault densities* as high as 1.5 faults per kNCSS. One of the products will be redesigned and the two others will have renewed desk checks and inspections to counter that.

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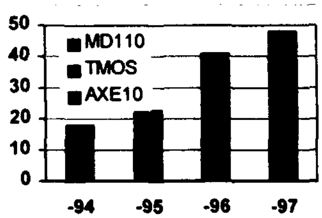
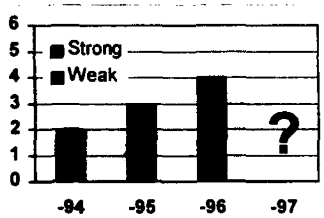
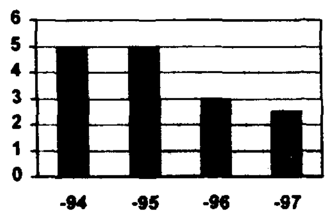
No of participating organisations



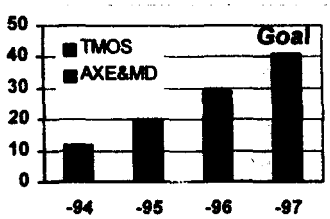
Level of deployment



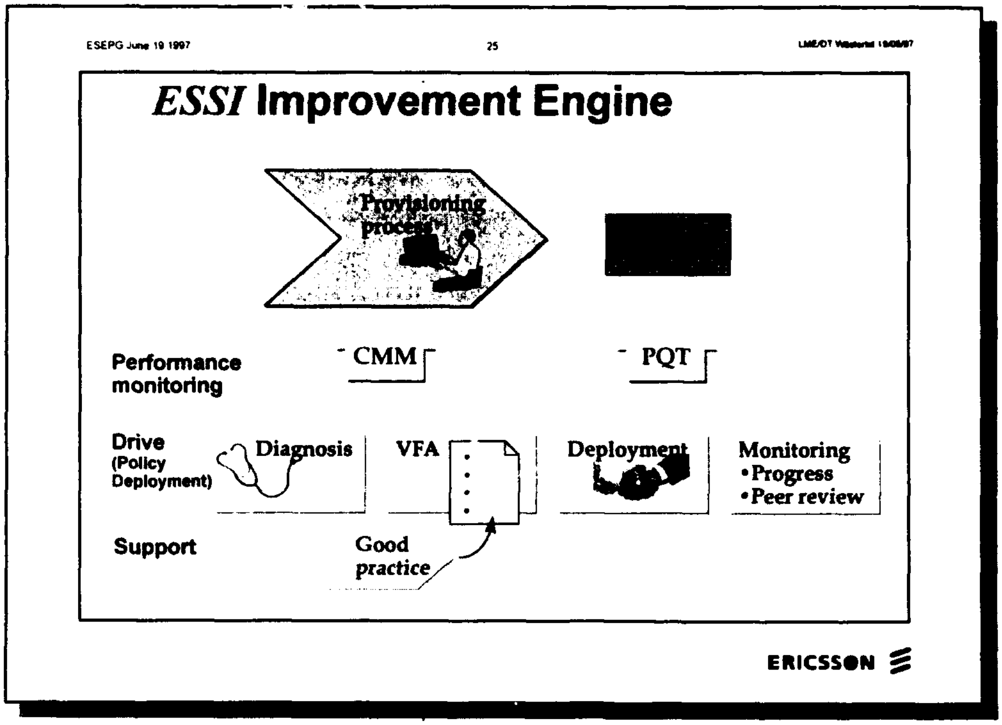
PD process lead-time

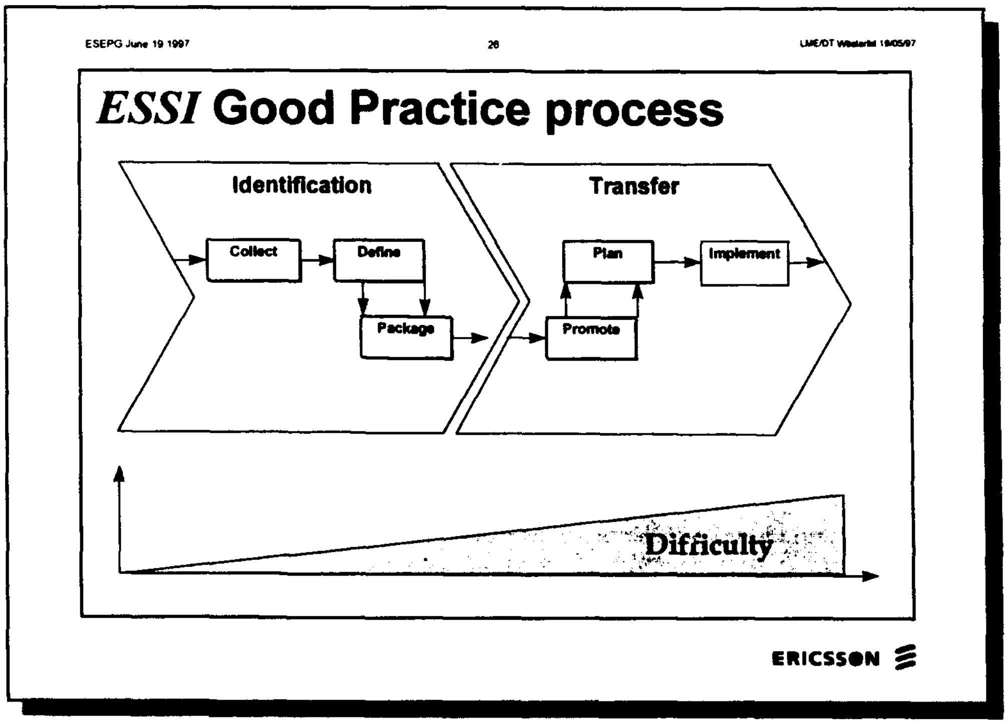


No of Peer Reviews



ERICSSON


ESEPG June 19 1997
25
ESSI Improvement Engine
Provisioning process
Performance monitoring
CMM
PQT
Drive (Policy Deployment)
Diagnosis
VFA
Deployment
Monitoring
•Progress
•Peer review
Support
Good practice
ERICSSON


ESEPG June 19 1997
26
ESSI Good Practice process
Identification
Transfer
Collect
Define
Package
Plan
Implement
Promote
Difficulty
ERICSSON

ESEPG June 19 1997 27 LME/DT Wasterlid 19/05/97

ESSI Good Practice characteristics

- supports a Vital Few Actions or a CMM Key Process Area
- is a packaged collection of practices from good performing design centres
- has performance indicators (facts) which show better than average performance
- is recognized by others (than the practice supplier) as a "better than most" practice
- is established and documented, *before* packaging starts
- has a support organisation
- is promoted by means of ESSI Policy Deployment
- has a Transfer support package

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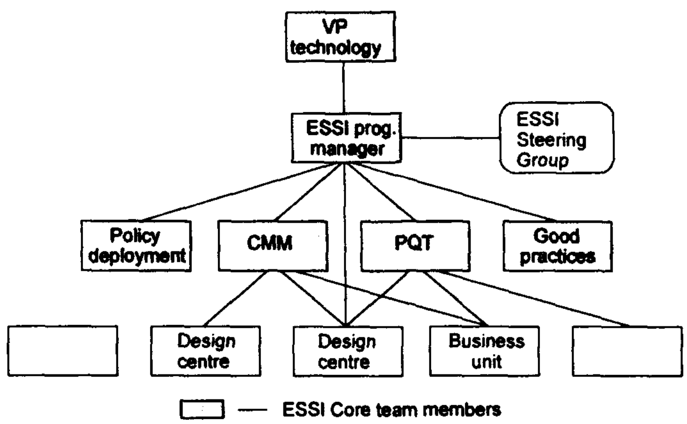
ESEPG June 19 1997 28 LME/DT Wasterlid 19/05/97

Organisation



ERICSSON

ESEPG June 19 1997 29

Summary

- The *ESSI* Ir vement Engine delivers significantly improved business results
- Practices are now transfered to other areas in Ericsson

ERICSSON

Software Process Improvement Journey

(From Level 1 To Level 5)

Keynote Presentation
at
The 2nd European Software Engineering Process Group Conference
Amsterdam June 16-19, 1997

Presenter: John D. Vu
Associate Technical Fellow
Software Engineering
Research & Technology
The Boeing Company

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John D. Vu

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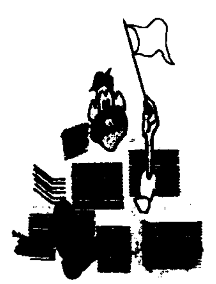
What Does Capability Maturity Levels Means?

Level 2 by 1992 ... and Level 3 by 1993 ... and ...

CMM



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Maturity Levels Are Meaningless ...

If They Cannot Be Explained

In Terms Of Business Objectives

- Improve the quality, cycle time, and reduce the cost of software activities
- Provide faster service, deliver higher quality products, and achieve customer satisfaction

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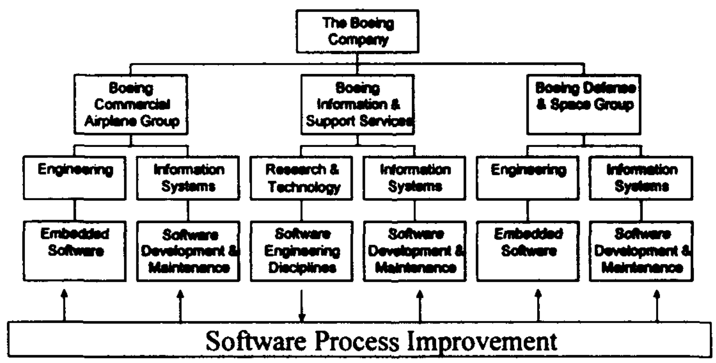
Boeing Software Organizations



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Maturity Levels At The Boeing Company

Capability Mature Levels are expressed in terms of

- **Assessment results (CBA/IPI)**
- **Business Improvement Data:**
  - **Quality**
  - **Cost**
  - **Cycle Time**
- **Customer Satisfaction**

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Institutionalization At The Boeing Company

To be considered "Institutionalized" a process must be

- **Defined**
- **Documented**
- **Practiced**
- **Measured**
- **Verified**
- **Maintained**
- **Continuously Improved**

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Level 1: Our Lessons Learned

Things we left behind	Things we learned
Schedule, Schedule, Schedule	Commitment, Commitment, Commitment
Guesstimate	Estimate
Undocumented practices	Documented practices
No measurement	Basic project measurements
No data	*Begin data collection*
Hurry, reactive-mode	Be patient, pro-active mode

Without management commitment, we never get out of this maze

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Level 2: Our Lessons Learned

Things we left behind	Things we learned
Project mismanagement	*Project management*
Schedule is fixed	Schedule is based on estimates
One way to do things	Variation exists
Heroic effort	Sharing of practices
No facts & data	Systemic data collection
Unique situation	Common process
Takes too long	Maintain commitment

We know where we are, we know how to get there, and we can repeat it

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Level 3: Our Lessons Learned

Things we learned

Project management robustness

Product management

Identify and share "best practices"

Knowledge transfer

Common measurements across projects

Product quality focus

Begin tracking product performance

We are becoming a learning organization via sharing of "best practices"

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Level 4: Our Lessons Learned

Things we learned

Project management robustness

Product management robustness

Correlation between process and product performance

Focus on cycle time and productivity

Additional measurements

Process Management: Managing by facts and data

Begin Product Line Management

We are using data to refine organization process and improve product performance

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Level 5: Our Lessons Learned

Things we learned

Project management robustness

Product management robustness

Process management robustness

Product line management

Focus on organizational capability

Improve market share

Technology transfer

Begin to look outside current business

> We are using organization capability to improve market share and to explore new business opportunities

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Journey From Level 1 to Level 3

Boeing Information Systems:

- Technology Planning
- Application Development and Maintenance
- Telecommunications Engineering
- Computer and Network Operations
- Multimedia Services
- Document and Records Management

Assessment History:

- Level 1 in 1991
- Level 2 in 1994 (120 Projects Participated)
- Level 3 in 1996

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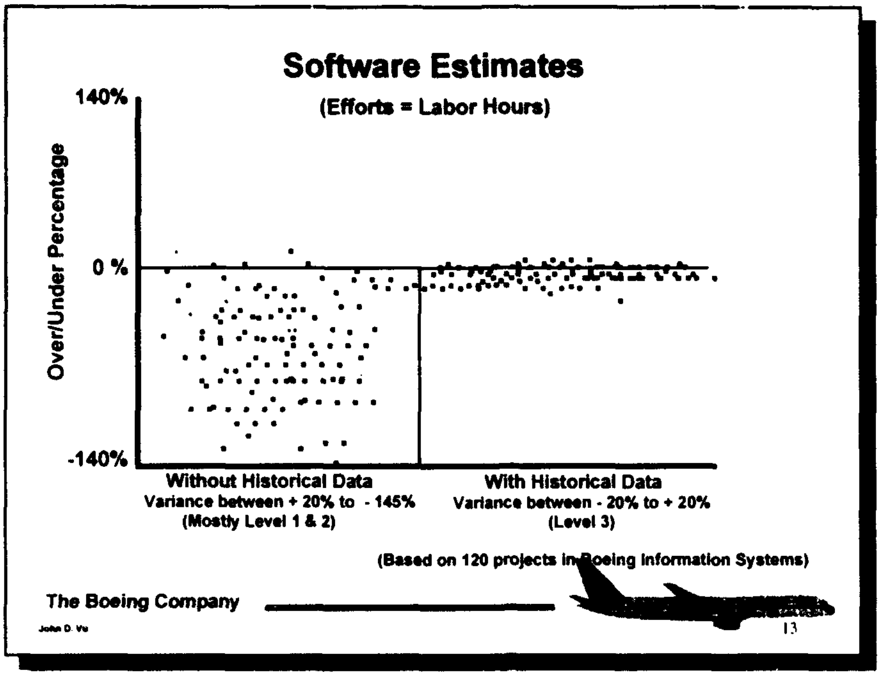
Software Estimates
(Efforts = Labor Hours)
140%
0 %
-140%
Over/Under Percentage
Without Historical Data
Variance between + 20% to - 145%
(Mostly Level 1 & 2)
With Historical Data
Variance between - 20% to + 20%
(Level 3)
(Based on 120 projects in Boeing Information Systems)
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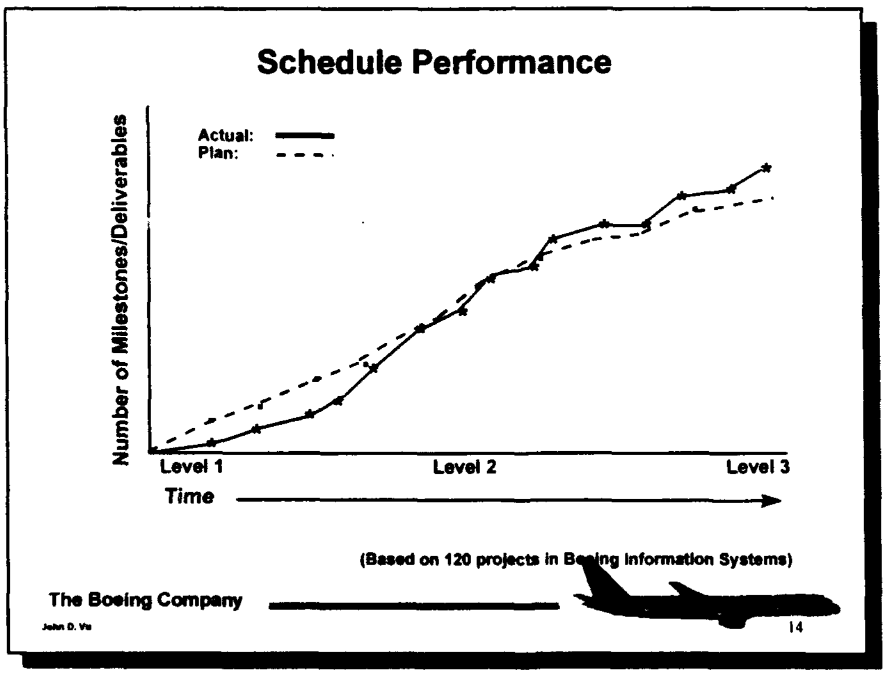
Schedule Performance
Actual:
Plan:
Number of Milestones/Deliverables
Level 1
Level 2
Level 3
Time
(Based on 120 projects in Boeing Information Systems)
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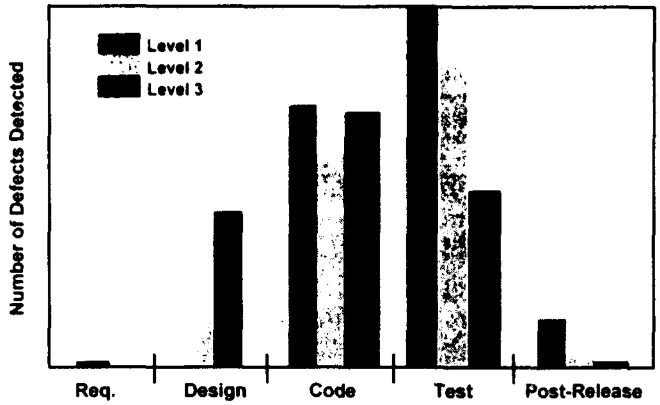
Defect Management



(Based on 120 projects in Boeing Information Systems)

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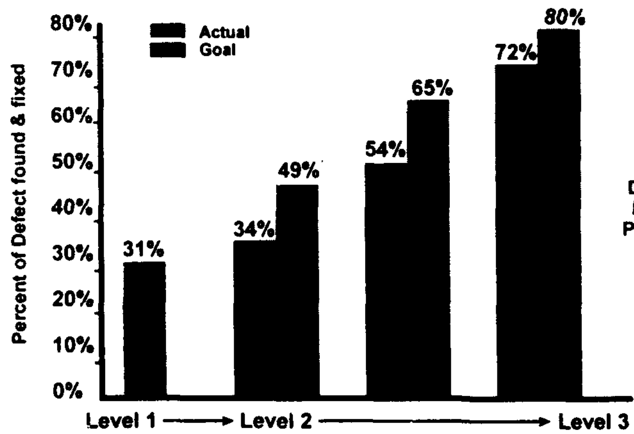
Defect Containment Effectiveness



Measure of Defects Contained *Prior To Software* Production Release

(Based on 120 projects in Boeing Information Systems)

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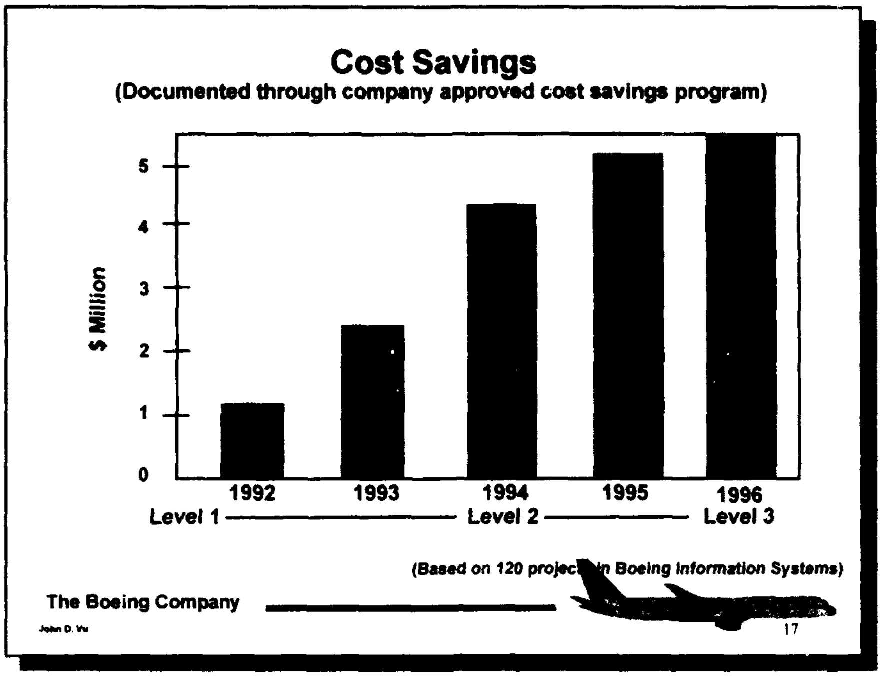
Cost Savings
(Documented through company approved cost savings program)
$ Million
5
4
3
2
1
0
1992
1993
1994
1995
1996
Level 1
Level 2
Level 3
(Based on 120 projects in Boeing Information Systems)
The Boeing Company
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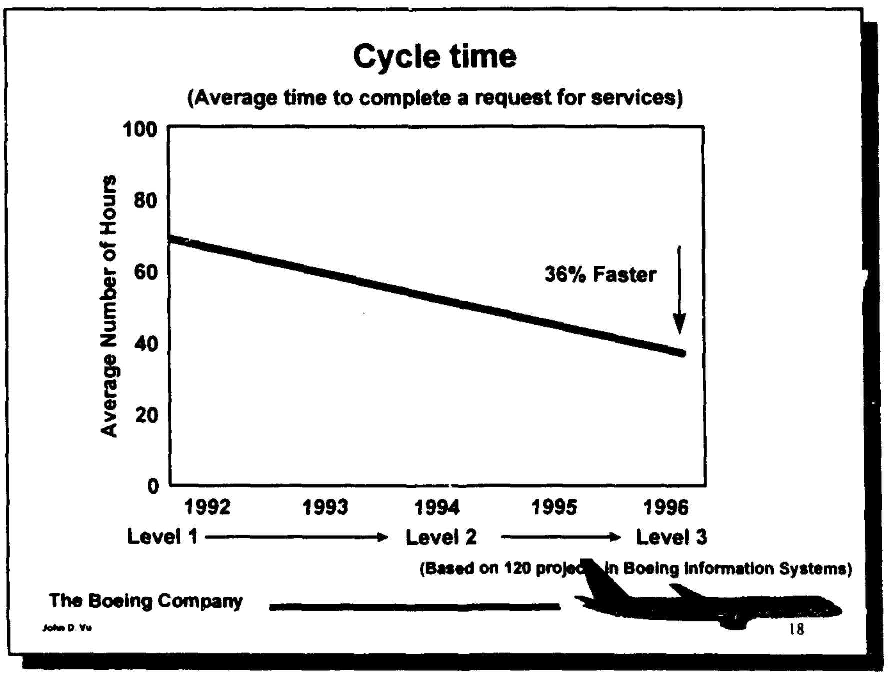
Cycle time
(Average time to complete a request for services)
Average Number of Hours
100
80
60
40
20
0
36% Faster
1992
1993
1994
1995
1996
Level 1
Level 2
Level 3
(Based on 120 projects in Boeing Information Systems)
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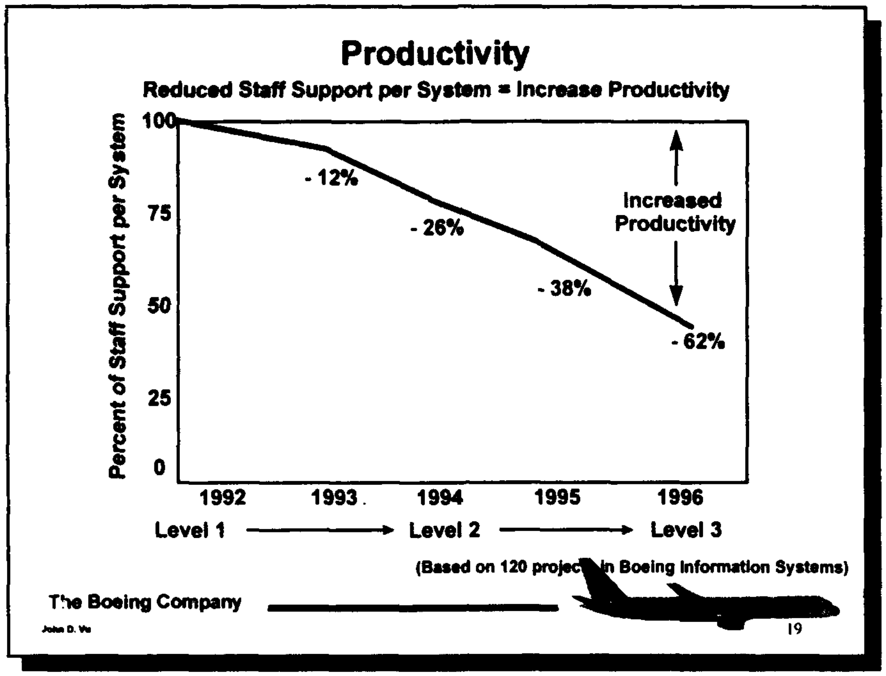
Productivity
Reduced Staff Support per System = Increase Productivity
Percent of Staff Support per System
100
75
50
25
0
- 12%
- 26%
- 38%
- 62%
Increased Productivity
1992
1993
1994
1995
1996
Level 1
Level 2
Level 3
(Based on 120 projec in Boeing Information Systems)
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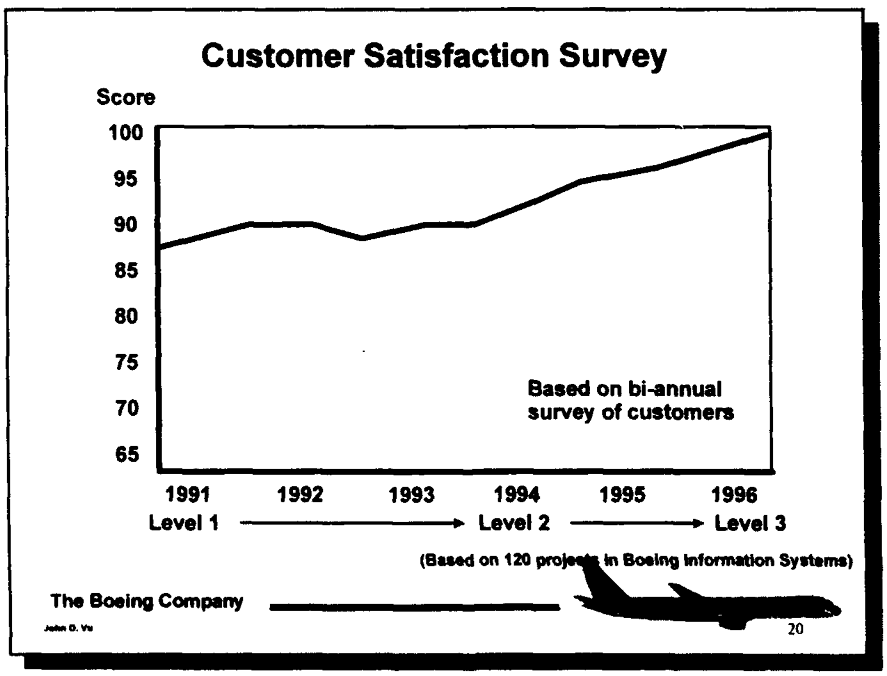
Customer Satisfaction Survey
Score
100
95
90
85
80
75
70
65
Based on bi-annual survey of customers
1991
1992
1993
1994
1995
1996
Level 1
Level 2
Level 3
(Based on 120 proje in Boeing Information Systems)
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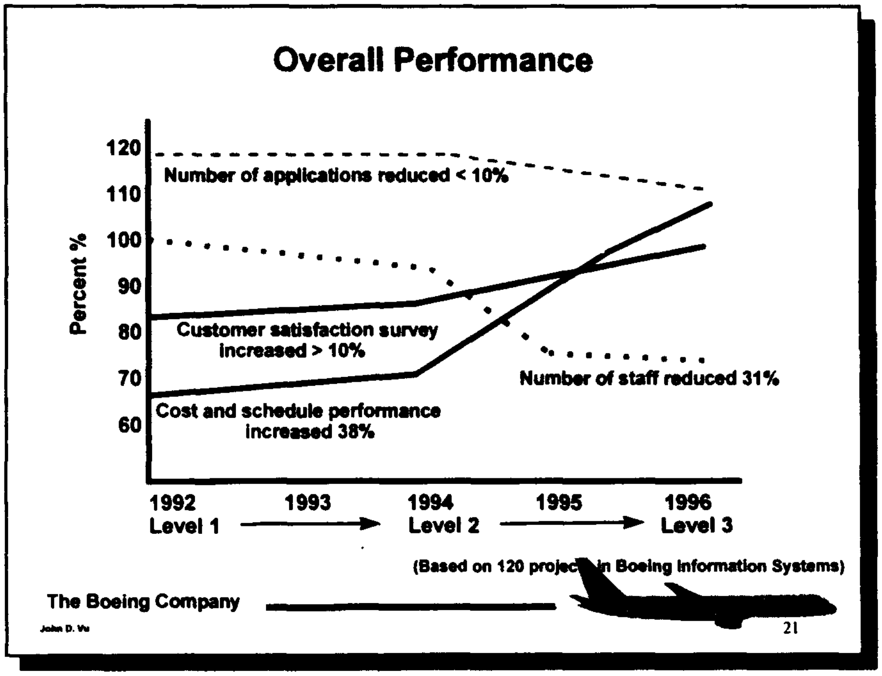
20


Overall Performance
Percent %
120
110
100
90
80
70
60
Number of applications reduced < 10%
Customer satisfaction survey increased > 10%
Number of staff reduced 31%
Cost and schedule performance increased 38%
1992 Level 1
1993
1994 Level 2
1995
1996 Level 3
(Based on 120 projects in Boeing Information Systems)
The Boeing Company
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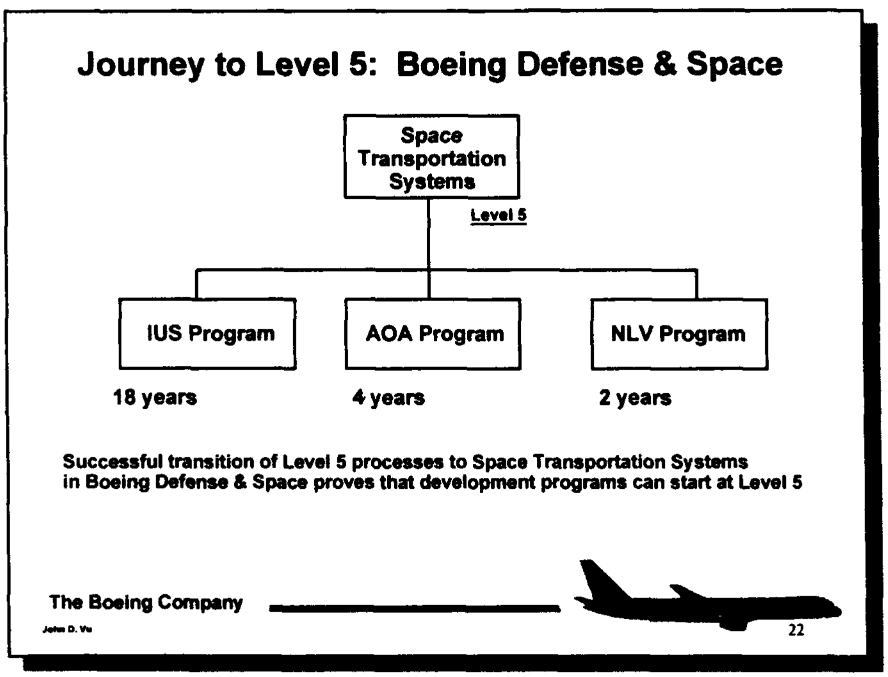
21


Journey to Level 5: Boeing Defense & Space
Space Transportation Systems
Level 5
IUS Program
AOA Program
NLV Program
18 years
4 years
2 years
Successful transition of Level 5 processes to Space Transportation Systems in Boeing Defense & Space proves that development programs can start at Level 5
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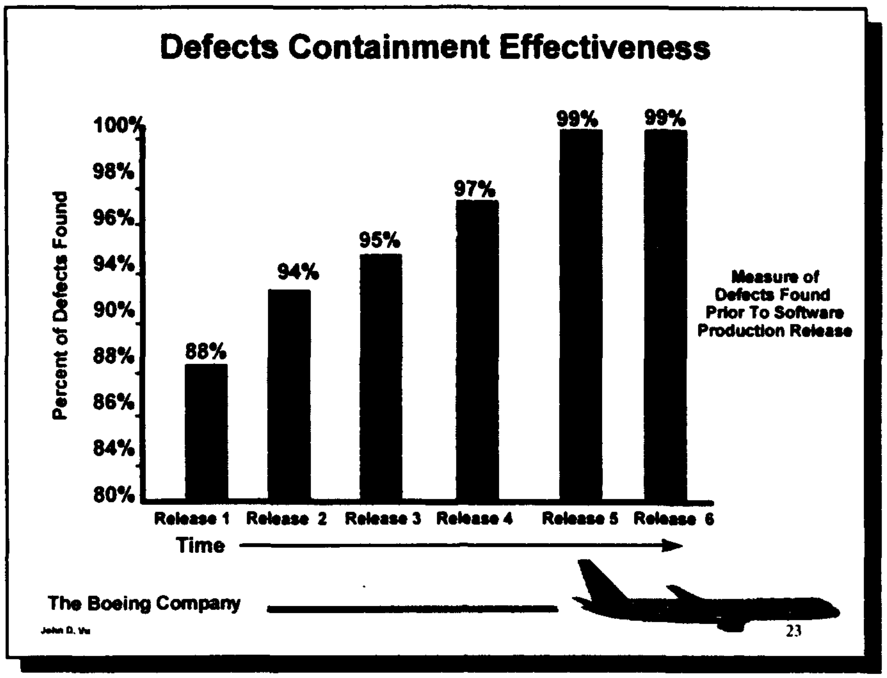
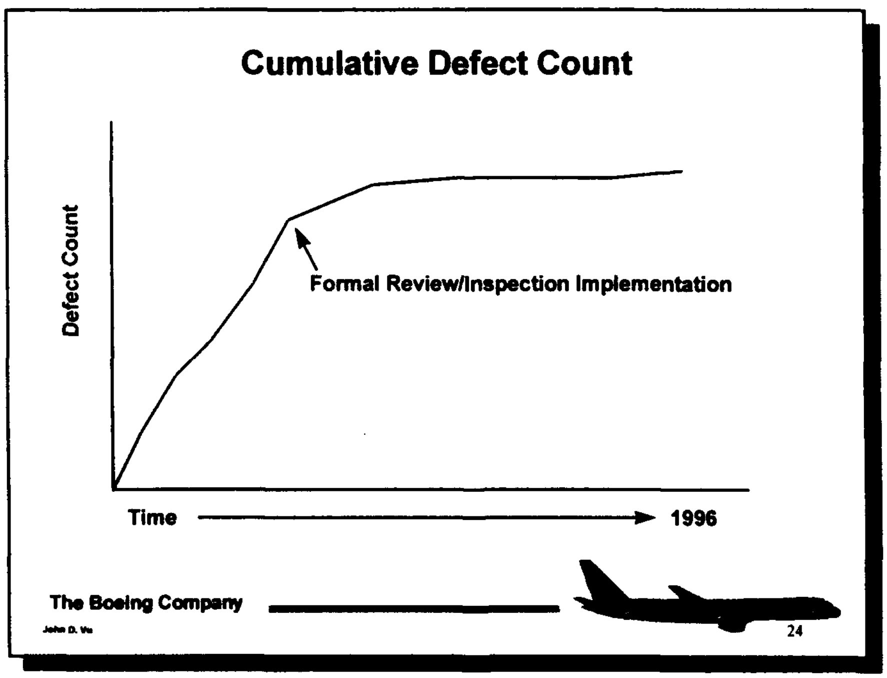

Defects Containment Effectiveness
Percent of Defects Found
100%
98%
96%
94%
90%
88%
86%
84%
80%
88%
94%
95%
97%
99%
99%
Release 1
Release 2
Release 3
Release 4
Release 5
Release 6
Time
Measure of Defects Found Prior To Software Production Release
The Boeing Company
John D. Vu
23


Cumulative Defect Count
Defect Count
Formal Review/Inspection Implementation
Time
1996
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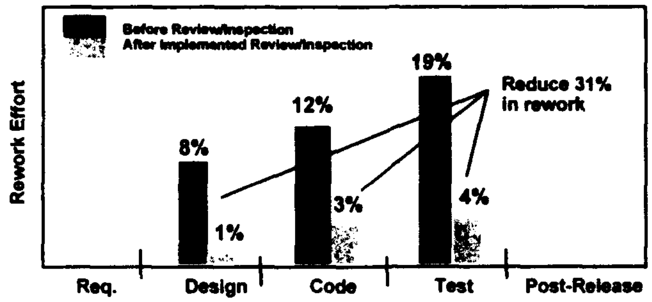
Defect Management: Benefit Ratio



Implementing Formal Review/Inspection increased design effort by 4%
decreased rework effort by 31%

Cost: Benefit ratio is 4% : 31% or 1 : 7.75

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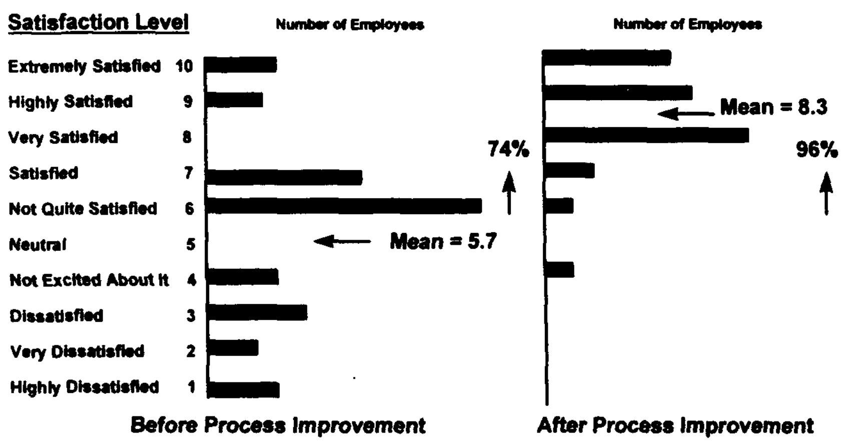
Employee Satisfaction



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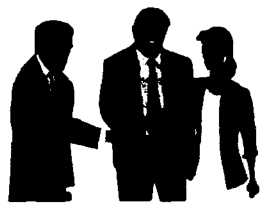
Our Success Factors

- Management Commitment
- Funding and Resources for Process Improvement
- Ability, Skills, Knowledge
- Measurement and Metrics
- Monitoring Mechanism
- Training (both Formal and Informal)
- *Culture of Engineering Excellence*
- Customer Participation



(Based on our Lessons learned on Software Process Improvement)

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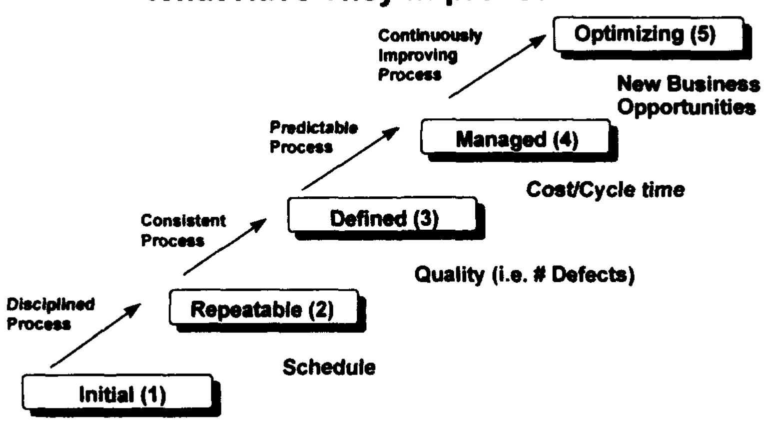
Process Maturity Levels: What Have They Improved?



(Based on our Lessons learned on Software Process Improvement)

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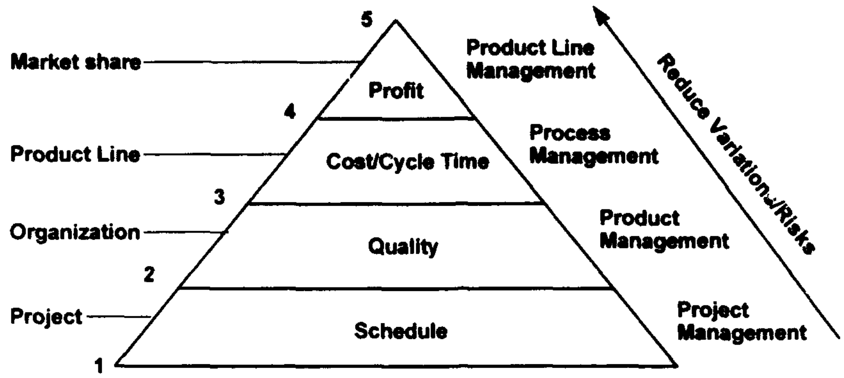
Our Observations



(Based on our Lessons learned on Software Process Improvement)

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Our Approach

- Integrate SWE-CMM and P-CMM assessment
  Pilot completed Jan. 97 successfully
- Apply Personal Software Process (PSP) to Level 3 organizations
  On-going pilots in 2 Level 3 organizations
- Acquisition-CMM
  On-going study
- Advanced Quality Systems (AQS) for software suppliers
  45 suppliers participated
  25 suppliers advancing to next stage

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We Believe

- There is a systematic approach to improve the way software is developed and maintained.
- There are stages of process maturity in which the organization will improve by following a recommended sequence to decrease risk and increase software performance.
- By following an evolutionary path the organization will continuously improve their business objectives by producing better, faster, and higher quality products, and achieve customer satisfaction.

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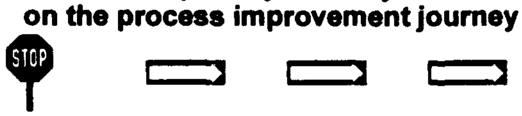
Conclusion

The software industry must express process improvement in terms of

- Business Improvement Data:
  - Quality
  - Cost
  - Cycle Time
- Customer Satisfaction

And use Capability Maturity Levels only as street signs on the process improvement journey



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Highlights and Report Back from The Measurement Symposium

Paul Goodman, TBL

This presentation will be developed at the conference following the Measurement Symposium on Tuesday 17th June. The material will be made available to delegates at the start of the session for inclusion in the handout folder.

Paul Goodman, Chairman of Tuesday's Measurement Symposium, will present highlights from the day's proceedings. Drawing from the rich variety of presentations which feature many of the leading experts in the field of metrics, Paul will extract lessons learnt, latest thinking and current best practice.

A QUARTER-CENTURY OF PROCESS IMPROVEMENT

Terry R. Snyder
Hughes Aircraft Company

HUGHES
AIRCRAFT

Reflections on a Quarter Century

HUGHES
AIRCRAFT

- **What We Did: It's a Long Story...**

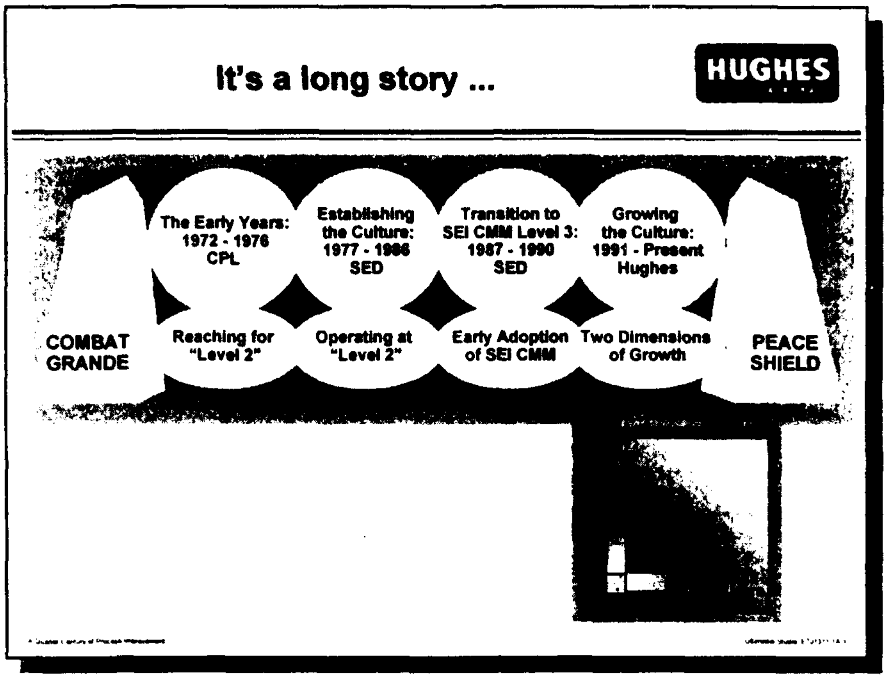
The Early Years: 1972 - 1976 CPL	Establishing the Culture: 1977 - 1986 SED	Transition to SEI CMM Level 3: 1987 - 1990 SED	Growing the Culture: 1991 - Present Hughes

- **Hard Learned Lessons: Truths**

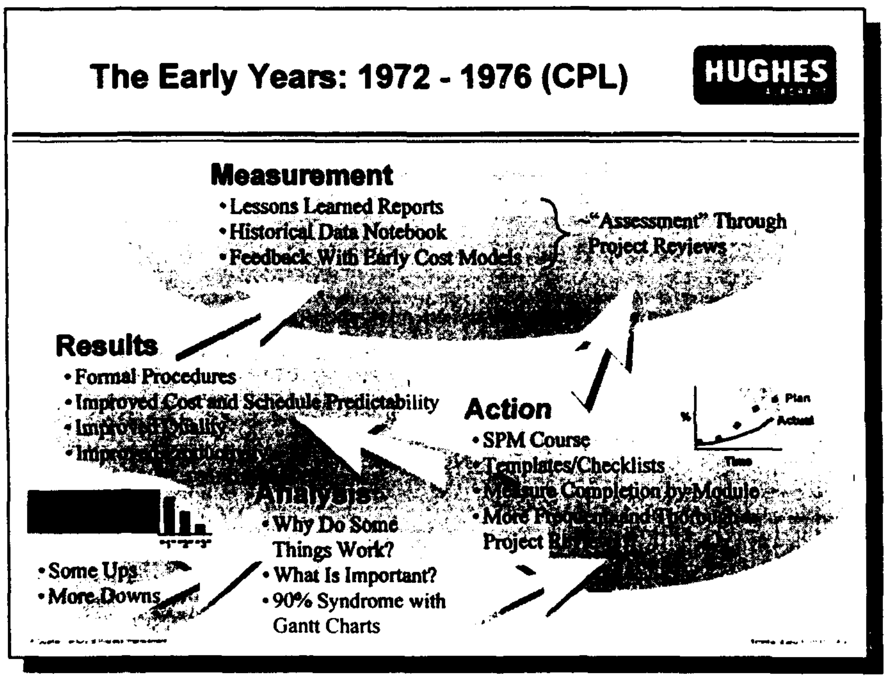
Truth 1: Culture — Truth 2: Deployment — Truth 3: Discipline

- **Future**

Systems Engineering	Project Mgmt and IPT	Other Disciplines
CMM Level 5	Specific Concerns	Technology



It's a long story ...
HUGHES
The Early Years: 1972 - 1976 CPL
Establishing the Culture: 1977 - 1986 SED
Transition to SEI CMM Level 3: 1987 - 1990 SED
Growing the Culture: 1991 - Present Hughes
COMBAT GRANDE
Reaching for "Level 2"
Operating at "Level 2"
Early Adoption of SEI CMM
Two Dimensions of Growth
PEACE SHIELD



The Early Years: 1972 - 1976 (CPL)
HUGHES
Measurement
• Lessons Learned Reports
• Historical Data Notebook
• Feedback With Early Cost Models
"Assessment" Through Project Reviews
Results
• Formal Procedures
• Improved Cost and Schedule Predictability
Action
• SPM Course
• Templates/Checklists
• Measure Completion by Module
Project
Plan
Actual
%
Time
Analysis
• Why Do Some Things Work?
• What Is Important?
• 90% Syndrome with Gantt Charts
• Some Ups
• More Downs

COMBAT GRANDE: 1974 - 1976

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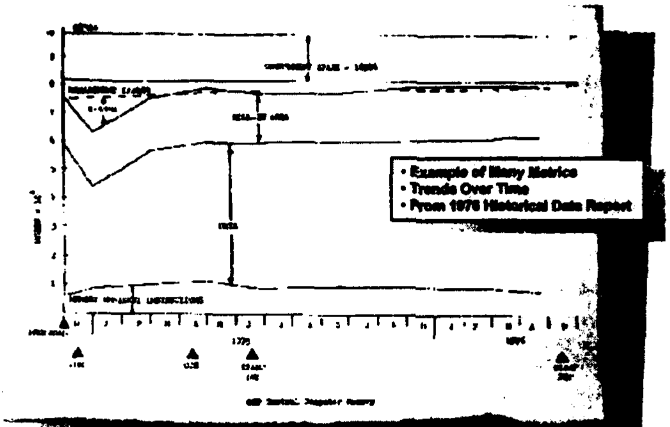

OCP Computer Memory

Establishing the Culture: 1977 - 1986 (SED)

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Ready for a Paradigm Shift

A More Formal Version of What We Had Been Attempting to Accomplish

- Powerful Computers
- Target = Development OK!
- COTS Hardware and Software
- A Decade of Improvement in Documented Process

- Our Own Host-Target Development Facility
- Our Own Development Environment
- Improved Procedures
- SED: 13 June 1978

- Slow, Limited Memory
- Non-COTS
- Debug Hardware and Software Together

ment
evelopment
ndor Support

Transition to CMM Level 3: 1987 - 1990 (SED)

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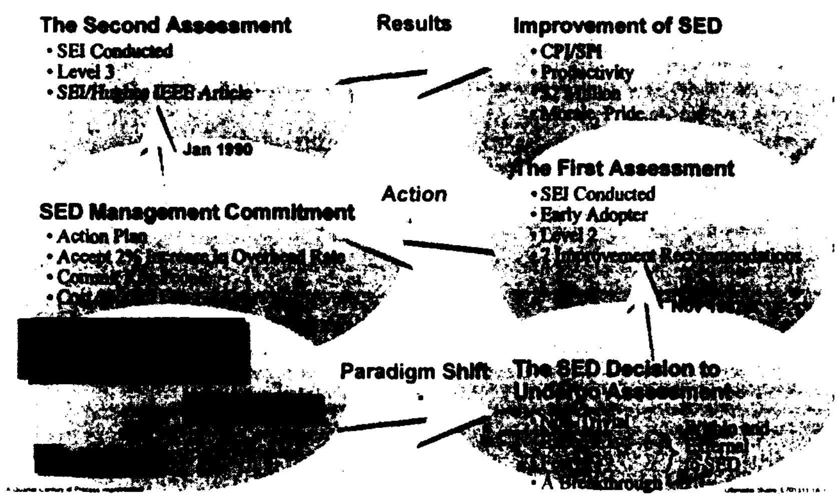

SED Process Maturity Relative to Industry

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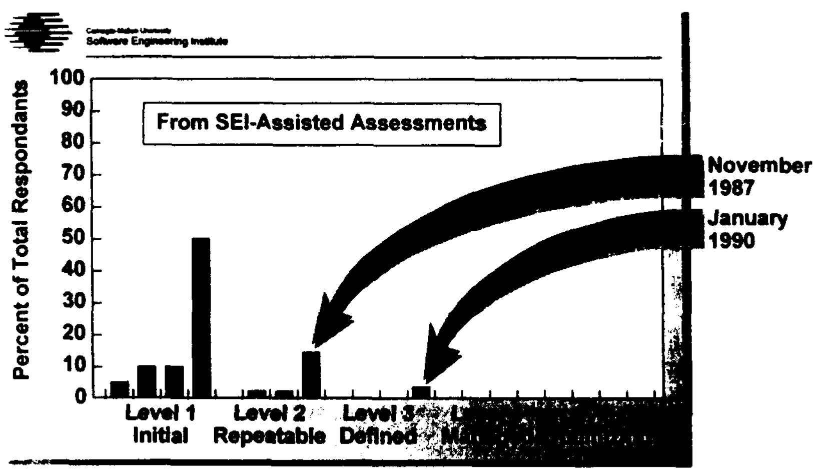

Example Results of Process Improvement

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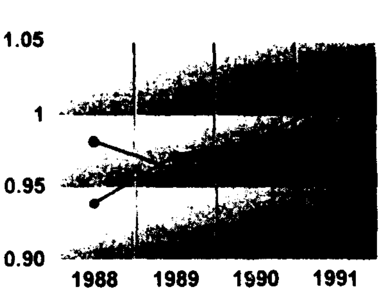


- CPI (Cost Performance Index) = Earned / Actual
- SPI (Schedule Performance Index) = Earned / Planned (or Scheduled)
- Values over 1.0 are below cost & ahead of schedule
- In 1990 (first year after Level 3 process maturity), saving of $2 Million on an annual basis
- One-year ROI of 5:1 based on process improvement investment

Growing the Culture: 1991 - Present (Hughes)

HUGHES

The Growth

The Payoff

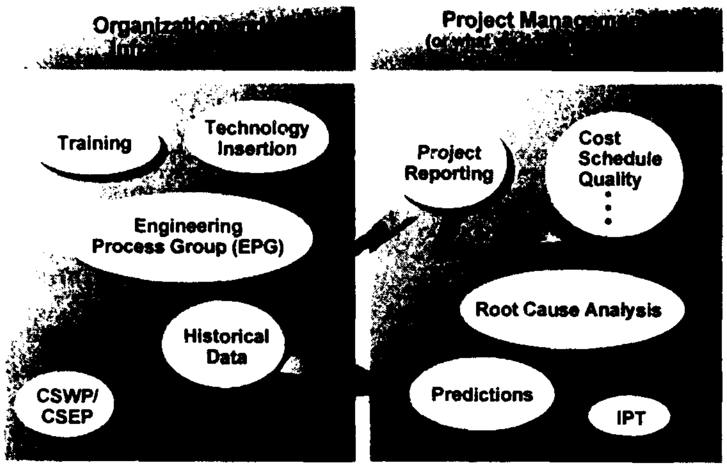
- Predictability (CPI/SPI -> 1.0)
- Higher Quality and Productivity
  - Fewer Defects
  - Less Rework
- ... Million Payoff)

[redacted]

- How We Operate
- Common Software Process (CSWP)
- Project ...
- Quan... ...ement

How We Operate: Systems and Software Engineering

HUGHES



Project Reporting with Metrics is a Key Issue

HUGHES

Many "Practices" Each with Supporting "Procedures"

Practice		
3	Project Reporting	
Procedures		
3.2.1	Project Overview	
3.2.2	Accomplishments Summary	
3.2.3	Problem Summary	
3.2.4	Project Schedule	(METRICS)
3.2.5	Risk Status	(METRICS)
3.2.6	Milestone	(METRICS)
3.2.7	Rate Chart	(METRICS)
3.2.8	Earned Value	(METRICS)
3.2.9	Target System Resource Usage	(METRICS)
3.2.10	Software Project Resource Forecast	
3.2.11	Financial / Staffing	(METRICS)
3.2.12	Quality Indicators	(METRICS)
3.2.13	Scope Change	(METRICS)
3.2.14	Lessons Learned	
3.2.15	Software Problems Status	(METRICS)
3.2.16	Productivity Measurement	(METRICS)
3.2.17	Size Trend	(METRICS)
3.2.18	Defect Density Tracking	(METRICS)
3.2.19	Requirements Volatility	(METRICS)
3.2.20	Software Management Effectiveness	(METRICS)

Improving the Common Engineering Process

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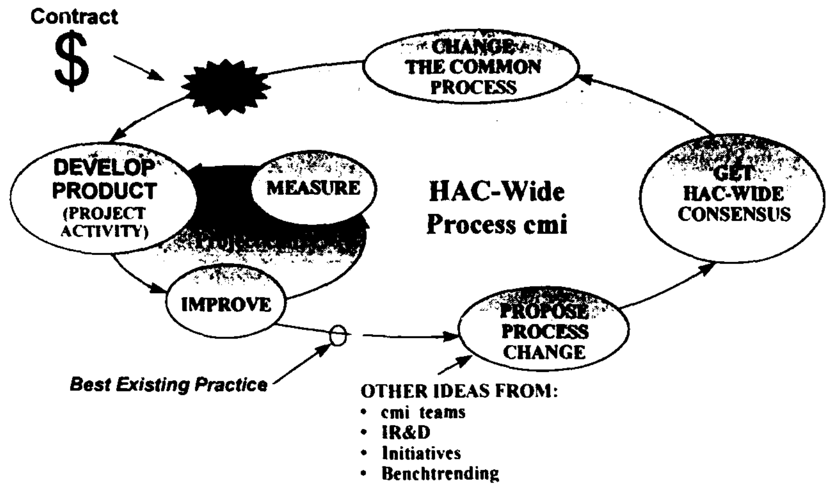


Defects and Review Efficiency

HUGHES AIRCRAFT

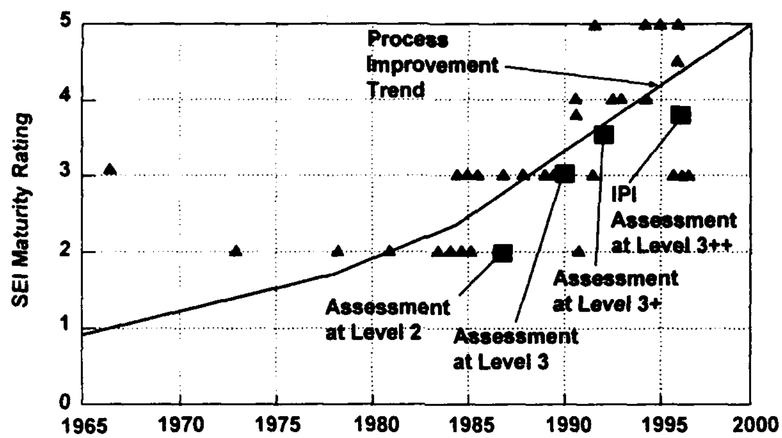
← Product →

Phase Detected

	R	P	D	C	U	I	X	Total
RA	84.0%							xx.x%
PD	xx.x%	xx.x%					xx.x%	[illegible]
DD	xx.x%	xx.x%	xx.x%		xx.x%	xx.x%	xx.x%	[illegible]
C	xx.x%	xx.x%	xx.x%	xx.x%	xx.x%	xx.x%	xx.x%	[illegible]
UT	xx.x%	xx.x%	xx.x%	xx.x%	xx.x%	xx.x%	[illegible]	[illegible]
IT	xx.x%	xx.x%	xx.x%	xx.x%	xx.x%	xx.x%	xx.x%	[illegible]
FT	xx.x%	xx.x%	xx.x%	xx.x%	xx.x%	xx.x%	xx.x%	[illegible]
ST	xx.x%	xx.x%	xx.x%	xx.x%	xx.x%	xx.x%	[illegible]	[illegible]
MN	100%	100%	100%	100%	100%	100%	100%	100%

Results of cmi: Process Improvement Over Time

HUGHES

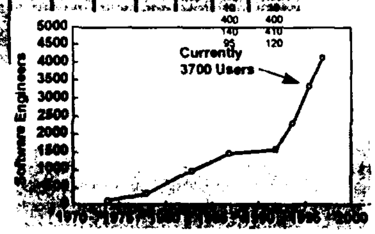


"Spreading the Wealth"

HUGHES AIRCRAFT

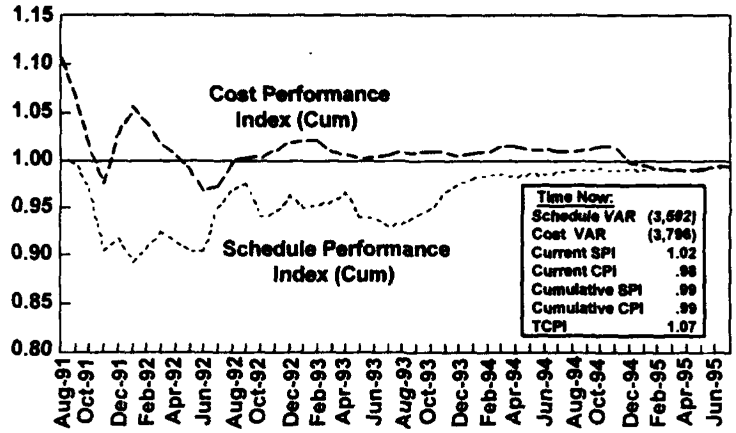
Number of Users at Known Milestones

	Informal SEPNs	Formal SEPNs	SED Formed	SEPPs	CSWP "Seed"	CSWP	Today	Projected
	1974	1978	1983	1987	1992	1994	1996	1997
Total Users	120	[illegible]	908	1400	1475	2319	3704	4293
Computer Programming Laboratory (CPL)	120	450	N/A	N/A	N/A	N/A	N/A	N/A
Software Engineering Division (SED)			908	600	200	N/A	N/A	N/A
Command Control Systems Division (CCSD)				800	800	1000	601	1000
SW Engineering Lab, Processor Div, 29-4x						135	130	130
SW Engineering Lab, Systems Div, 23-2x						375	375	375
SW Engineering Lab, Microwave Div, 27-xx					100	100	150	175
Software Systems Center (EOS)					225	225	400	400
Hughes Missile Systems Company (HMSC)					150	250	300	350
Naval And Maritime Systems (NAMS)						84	173	173
HITS, Denver							250	250
HITS, Defense Systems (Reston)							350	350
HITS, Landover						150	150	150
Danbury							40	[illegible]
Delco, Kokomo							400	400
[illegible]							140	410
[illegible]							95	120



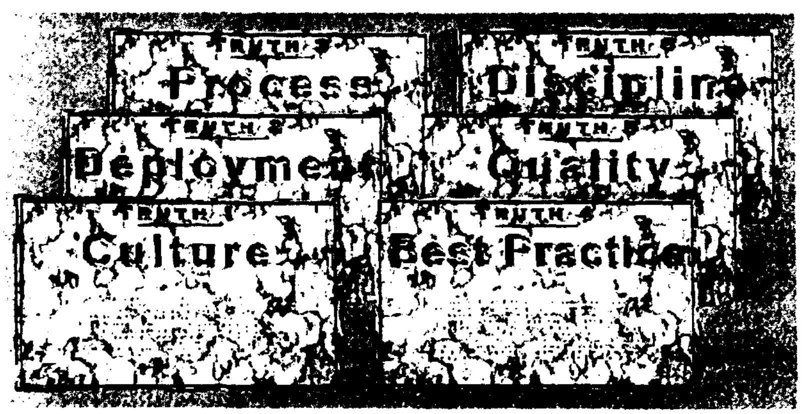
Peace Shield Performance

HUGHES



Truths ...

HUGHES



Truth 1:
Cultural Changes Take Time

HUGHES

TRUTH 1
Culture

- More specifically, you can't immediately go from CMM Level 1 to CMM Level 3, or even to Level 2
- No matter what your boss says!
- And no matter how eager your staff.

Truth 2:
Process Definition is Easy - Deployment Hard

HUGHES

TRUTH 2
Deployment

- You can buy or adopt a set of great processes
- But teaching them and ensuring their use is tough
- Project reviews are a key issue
  - Much of the CSWP devoted to project reviews
  - Conduct by the right managers with authority
- Train, Train, Train
- Measure the deployment process itself

Truth 3: Key Process Characteristics

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TRUTH 3

Process

- Metrics are a requirement
  - *Capture trend and cumulative data*
  - Use metrics that are meaningful to project and business
- Measure schedule day by day, every week
- Reuse is a must: systematic and technology-based
- Control requirements growth and volatility
- Map all audits to a single system

Truth 4: Pick Best Practice

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TRUTH 4

Best Practice

- Take some existing standard and just adopt it ... then improve it
- Don't try to innovate, at least not right away
- Don't try to "combine the best" of several practices
- Do improve; after deployment and project experience
- Do adopt; internal, benchmarking or from the literature
- Do share; benchmarking and publishing gets feedback

Truth 5: Quality

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TRUTH 5
Quality

Quality is:
- A pervasive way of life
- A measure of individual integrity and pride
- An organization of quality people
- What it takes to meet our customers' expectations
- What it takes to meet our employees' expectations
- What it takes for others to acknowledge us as a leader

Quality is not:
- Quality cops
- A quality assurance organization

Build quality into the process!

Truth 6: Discipline is Key

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TRUTH 6
Discipline

- Reward the followers, especially problem-avoiders
- Admonish the naysayers
- Project reviews are vital
- Reviews must be by managers who:
  - Have authority to cause change
  - Believe in disciplined software process
  - Are relentless

Focus on Process for Success

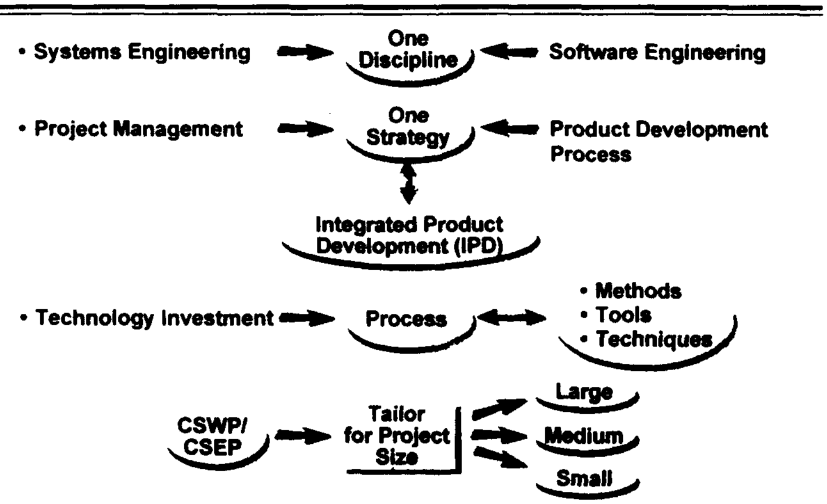
HUGHES

- There is a process
- The process has a responsible owner
- The process is documented
- There is training for the process
- The process is under control
- The process has a mechanism for continuous impr[illegible]
- The process is followed
- The process is part of the organizational culture

If the process owners, [illegible] discipline," create these elements, success is theirs.

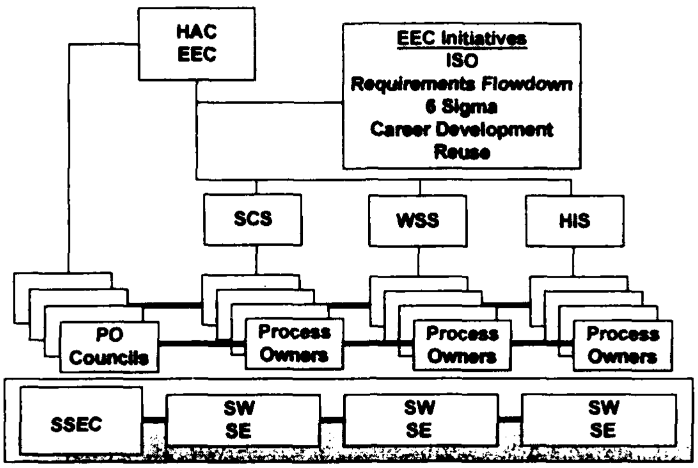
Current Issues and Concerns

HUGHES



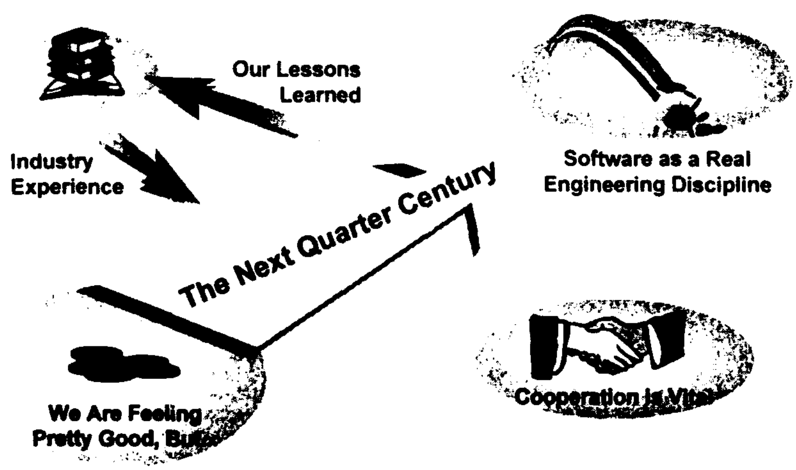
Systems and Software Engineering Council (SSEC)

HUGHES



The Next Quarter Century ...

HUGHES



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Continuous Quality Improvement in Software Development on the Basis of Measurement and Assessment

Holger Günther, Allianz Life

Allianz Lebensversicherungs-AG

Galilei: "Measure what is measurable
and what's not measurable
try to make it measurable"

Lord Kelvin:
"The degree to which you can
express something in numbers
is the degree to which you
really understand it"

Tom DeMarco:
"You can not control
what you can not measure"
(You can't manage
what you can't control)"

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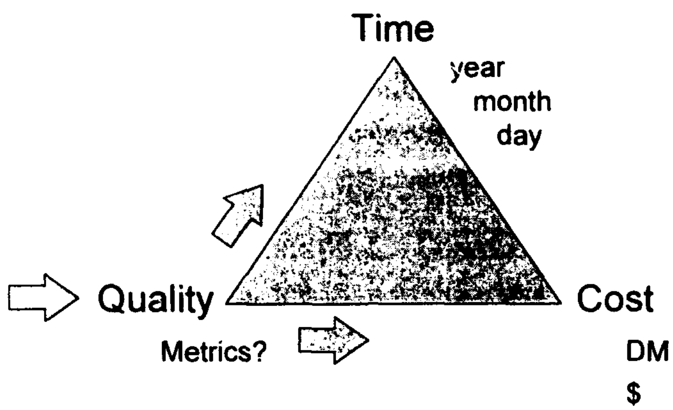
Magic Triangle of AD



3

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What is my message?

- motivation
- objectives
- history
- view
- investment
- results
- theory

4

Motivation for AZL

- huge investments in C/S-Application Development
  - technology
  - process
  - people

⇨ acceleration of the maturity-process

philosophy

- first understand then make changes
- process changes must be driven by
  - specific goals!
  - characteristics of the environment
  - product attributes
  - experimental approach
- incremental and provable changes!

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prodecure

- quantify the quality of products and processes with help of metrics
- understand the current situation
- identify and implement improvements
- evaluate progress
- structure experience
- improve continuously the maturity of products and processes

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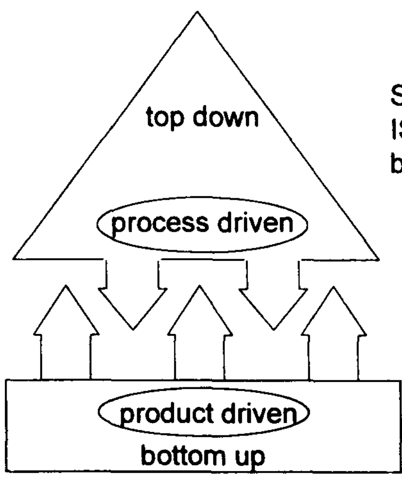
basic approaches



SEI-CCM, bootstrap
ISO 9001
benchmarks "best practices"

QIP, GQM
experience factory

8

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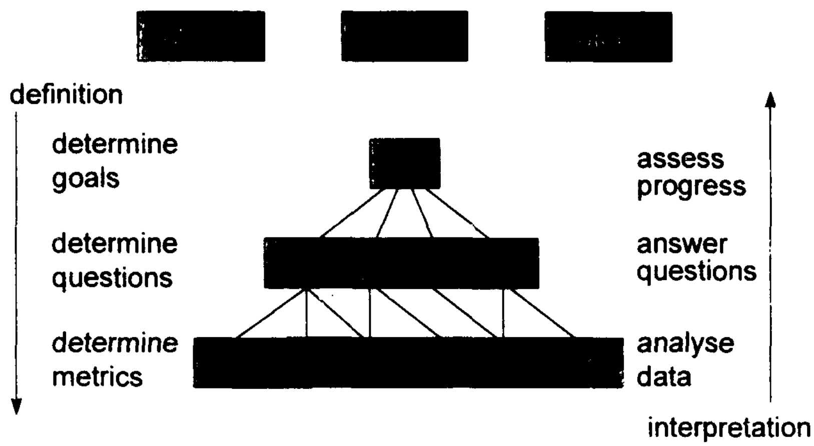
GQM Method



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Principles

<u>clear</u>
- what is measured and why?
- who is interested or affected by it?

<u>interpretation</u>
- primarily by application-developers
- (self-)assessment

<u>consciousness about data sensitivity</u>
- definition of aggregation levels
- access protection
- anonymity

10

GQM-Catalogue of AZL

analysis of the AD-process
analysis of the AD-products

1. effort distribution
2. stability of business-requirements
3. flexibility in the development and administration of insurance products
4. (same box as 3)
5. maintainability

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Goal:	G200: Increase stability of business requirements
Question:	Q208: How many changes were requested in the implementation phase
Metrics:	M245: Number of defects concerning program changes M246: Number of defects concerning specification M247: Number of defects concerning environment

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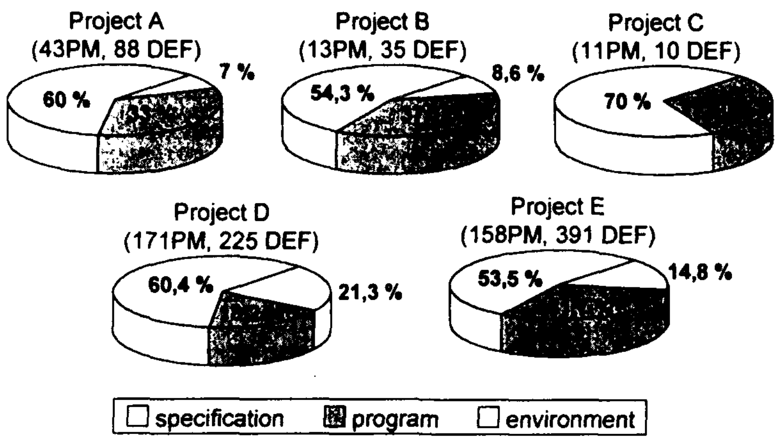
distribution of defects



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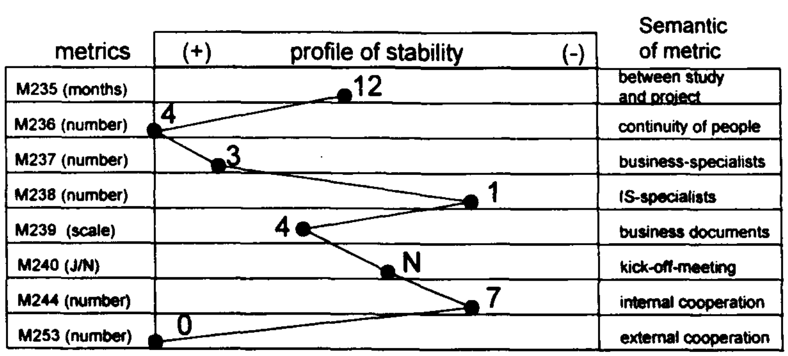
F210: How was the business preparation of the project?



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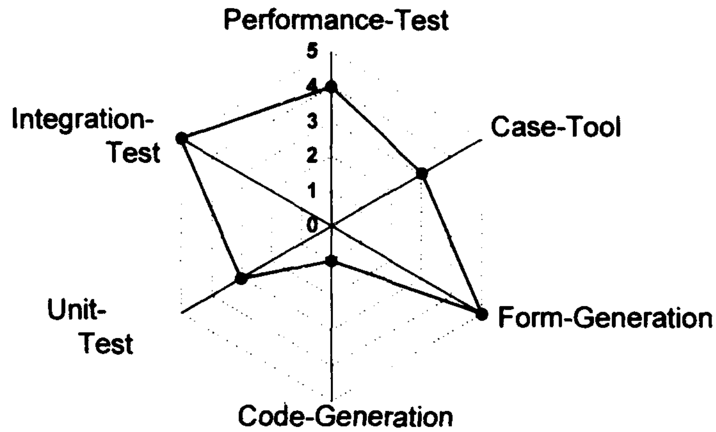
use of tools



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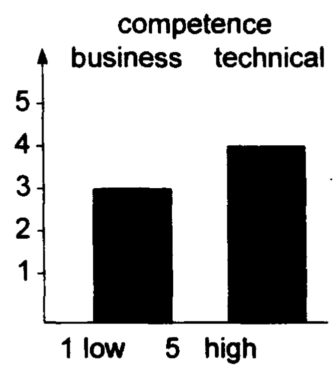
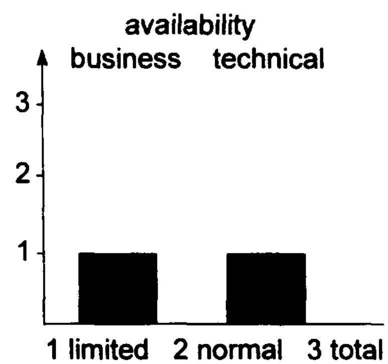
structure of project group





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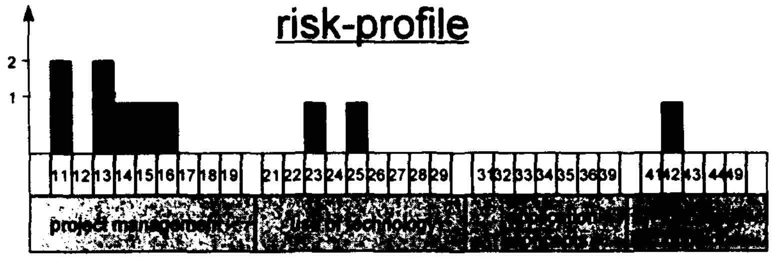
risk-profile



1 high 2 extreme

R11 critical deadlines (time boundaries)
R13 knowlege monopoly at project critical positions
R14 still pending decisions
R15 influence of parallel projects
R16 cooperation with externals
R23 performance requirements
R25 reusability
R42 premises unclear

17

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Goal-Definition-Scheme:

- Object: Application Development Process
- Purpose: Characterize
- Aspect: effort distribution including rework
- Viewpoint: Project leader
- Context: Allianz Life (Host-AD)

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Abstraction sheet

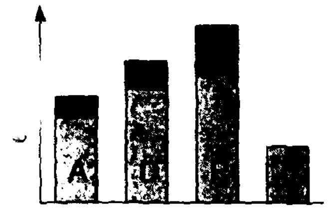
Qa (Quality aspect):
effort distribution including rework in

- Analysis (A)
- Design (D)
- Realization (R)
- Implementation (I)

Influence factors (IF):

- experience of project group (IF1)
- availability of resources (IF2)
- stability of business-requirements (IF3)

⋮



Influence on Quality?
(1) Qa ~ 1/IF1
(2) Qa ~ 1/IF2
(3) Qa ~ 1/IF3

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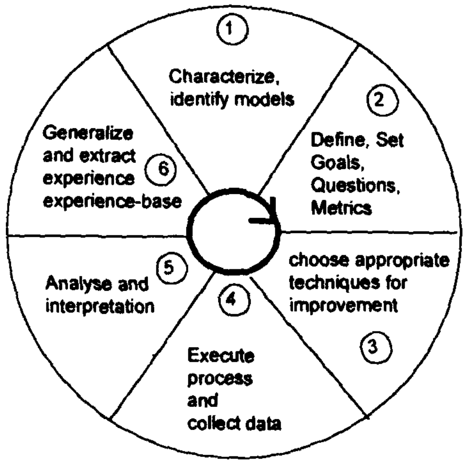
QIP-Process



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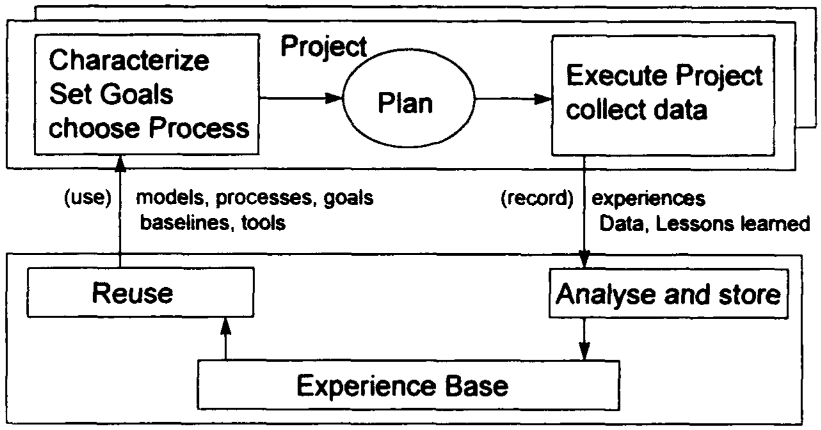
The Experience Factory



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resources bound for measurement in AZL

Experience factory

1 person year in the role of consultant and Service Support
at the moment we are able to support 4 projects in parallel

Projects:

about 2 % of project effort 3-4 days establishment and tailoring, hypothesis
2-3 days collection of data
2-3 days analysis and interpretation, feedback

optimization is possible through better tool support:
- Experience-Database
- automatic transfer of data from project management, data dictionary etc.
- Reuse of models

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Focus on projects with the following characteristics

- similar projects/applications in the future, which can profit from experience
- Pilot projects, which introduce new technologies, processes or methodologies
  - Goal: Shorten the maturity period

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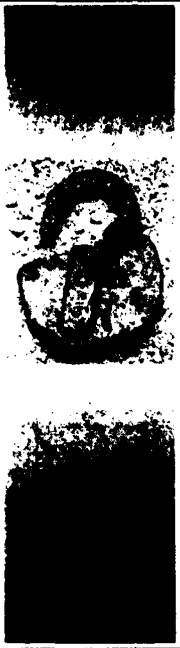
Summary

- approach is widely accepted
- it brings value even to the pilot-projects
- we are now in the phase of improvement
- we have developed tools (experience database, etc.)
- we want to establish basic metrics for all projects
- we even want to establish the QIP- and GQM-approach outside the application-development-environment

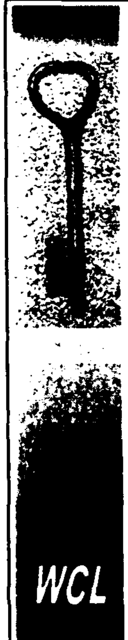
24



WCL **Warwick Consulting Ltd**

Overcoming Resistance

Overcoming resistance to change in SPI environments to become a true 'learning organisation'.

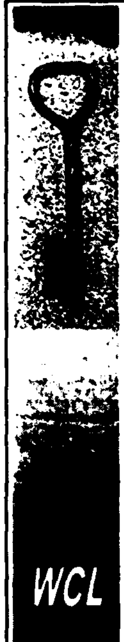


Introduction

... I went to the woods because I wished to live deliberately, to front only the essential facts of life, and see if I could not learn what it had to teach, and not, when I came to die, discover that I had not lived. I did not wish to live what was not life, living is so dear; nor did I wish to practise resignation, unless it was quite necessary. I wanted to live deep and suck out all the marrow of life, to live so sturdily and Spartan-like as to put to rout all that was not life, to cut a broad swath and shave close, to drive life into a corner, and reduce it to its lowest terms, and, if it proved to be mean, why then to get the whole and genuine meanness of it, and publish its meanness to the world; or if it were sublime, to know it by experience, and be able to give a true account of it in my next excursion. For most men, it appears to me, are in a strange uncertainty about it, whether it is of the devil or of God, and have somewhat hastily concluded that it is the chief end of man here to "glorify God and enjoy him forever." ...

Henry David Thoreau

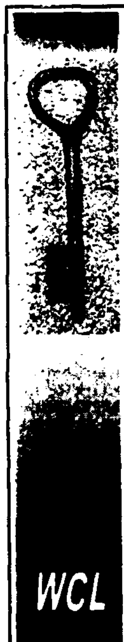
 2



Introduction

- Resistance is a problem in all change initiatives.
- Resistance can be both covert and overt.
- Resistance to change costs organisations millions of pounds each year.
- Implementation 'models' do not, and can not, solve the problem.

3



Chaos, Systems and Change

- Each element of a system embodies and reflects every other element.
- A chaotic element cannot be stabilised by another chaotic element.
- Chaos found at one level of a system will be present at all other levels within the system.
- Human thought and cognition is a central element of any changing system.

4

The ongoing problem of resistance

- 'Static Mechanisms'
  - Homeo-static;
  - Socio-static;
  - Enviro-static; and
  - Cognito-static.
- Levels of Change
  - 1st Level Change - Evolutionary Change;
  - 2nd Level Change - Revolutionary Change; and
  - 3rd Level Change - Changing the Change Process.

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Why Levels of Resistance Are Increasing

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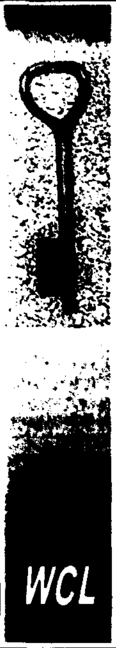
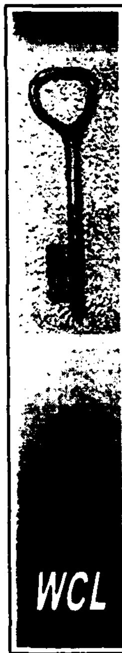


Why is the Rate of Change Increasing?

- Information Technology
- Communications
- Transportation
- Media



Control of Resistance

- Resistance is under perceptual and cognitive control.
- The perceptual and cognitive apparatus of an individual can be 're-tuned'.
- 3rd Level Cybernetic Change abolishes resistance and establishes learning by changing the process of changing.

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The Structure and Process of Resistance

- Resistance has a definite structure and process that can be elicited and 'mapped' like any other business process.
- The structure and process of resistance is absolutely unique to an organisation.
- This structure and process is the same regardless of the type of change being implemented.

9

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Mapping the Structure & Process of Resistance

- Resistance is a combination of 'real' things not just an abstract term. Deal with specifics that can be measured.
- If you have 'the right' information, change becomes simpler and quicker.
- A complete set of data is needed including:
  - 'The What' - Descriptions & Behaviours;
  - 'The How' - Explanations & Processes; and
  - 'The Why' - Justifications & Reasons.

10

Culture, Resistance & SPI

- Culture plays a central role in SPI.
- CMM / P-CMM / 'IDEAL' / SPICE are all retrospective construct models. They cannot be used to implement cultural change - no generic 'model' can.
- The only 'how to' implementation model that will work is one that is specific to an individual organisation.

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Why Bother?

- All forms of change including SPI are expensive to implement.
- Resistance increases the cost of change implementations on average by 400%.
- Change becomes increasingly more difficult after each 'failure'.
- Measurement and tracking of change becomes possible.

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12

Tools for Overcoming Resistance

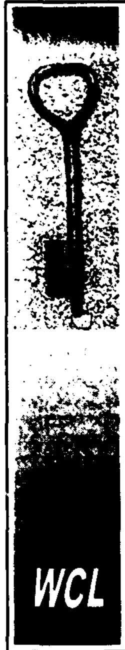
❶ Training with 'covert' change;

❷ Distracted change; and

❸ Recursive Benchmarking™.

Benchmarking

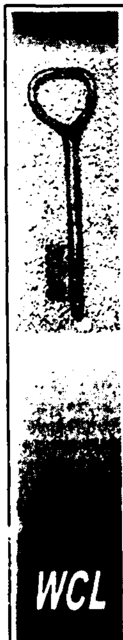
- Benchmarking is no longer confined in scope and attention to metrics and metrics objects.
- If Benchmarking is seen as solely metrics it is the cause of significant resistance.
- Benchmarking is the 'reach-out' activity of comparing yourself and your organisation against others.



4 Types of Benchmarking

1. Process Benchmarking;
   - Work Processes & Operating Systems
   - Most Effective Operating Practices
   - Increased Performance & Bottom Line Results
2. Performance Benchmarking;
   - Assessment of Competitive Position
   - Widely Used in Business and SPI e.g. FPA
3. Strategic Benchmarking; and
   - Examining How Others Compete
   - Cross-Industry Strategies, Structures & Processes
   - Requires Considerable Investment
   - Produces Significant Results
4. Recursive Benchmarking™.

 15



7 Levels of Benchmarking

1. Learning from Past Successes;
2. 'Borrowing' Good Ideas;
3. Best in Organisation;
4. Industry Standard;
5. Industry Leadership;
6. Best in Country Leadership; and
7. World Class Leadership.

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Recursive Benchmarking ™

- ✦ Recursive Benchmarking ™ is a set of tools, processes and corrective interventions to assist with
  - Measuring Change;
  - Mapping & Modelling Change;
  - Initiating Change;
  - Driving Change; and
  - Improving the Process of Changing.

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Applications and Benefits of Recursive Benchmarking™

- ✦ Setting & Refining Strategy;
- ✦ Reengineering Work & Business Processes;
- ✦ Problem Solving;
- ✦ Education & Idea Enrichment;
- ✦ Market Performance Comparisons;
- ✦ Catalyst for Change; and
- ✦ Reduction of Overt and Covert Resistance.

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How Recursive Benchmarking™ Reduces Resistance

WCL

- It acts as an example of the processes that the organisation is seeking to adopt.
- It 'opens up' individuals and teams by involving them at an early stage.
- It 'sets up' individuals and teams to accept change as positive and to integrate it.

Conclusion.

WCL

- Recursive Benchmarking™
  - Is one of a number of tools that can be used to drive the cultural changes and learning that are required for a successful implementation of SPI.
  - Provides business driven quantitative and qualitative metrics data.
  - Is a method for increasing organisational learning and changing the change process itself.

Finally...

Co-operative Change Is Effective and Produces Results

Leaving It To Chance Is A Recipe For Disaster.

21

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A Co-ordinated Approach to Identifying Software Development Risk in MoD Projects

DERA

European SEPG '97 - 1

Speakers

- **Llewelyn Jones**

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DERA

European SEPG '97 - 2

Agenda

- Background
- Method Selection & Enhancement
- Benefits
- Implementation

European SEPG '97 - 3

DERA

Background

European SEPG '97 - 4

DERA

The Problem

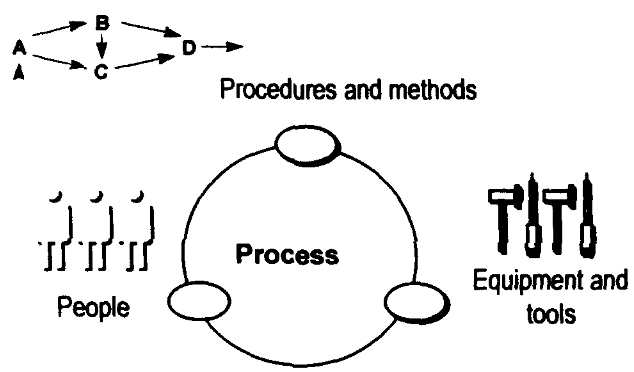
- House of Commons Defence Committee Concerns
- Difficulty in Evaluating Software Bids
  - software characteristics
    - *lack of visibility*
    - *intangible*
- Process method required to identify risks

European SEPG '97 - 5

DERA

Process

- '...the integration of people, procedures and methods, equipment and tools to produce the desired end result...'



European SEPG '97 - 6

DERA

SCE

- '...independent team evaluation of an organisation's software process...'
- '...using the CMM...'
- '...in the context of a particular acquisition...'
- Preparation
- Site visit to each supplier
  - Personnel interviews
  - Document reviews
- Analysis and reporting

European SEPG '97 - 7

DERA

Sampling

- *Team determine:*
  - Which *projects* to review
  - Which *KPAs* to assess
  - Which *goals* to rate
  - Which *topics* to probe
  - Which *staff* to interview

European SEPG '97 - 8

DERA

Method Selection and Enhancement

European SEPG '97 - 9

DERA

Selection

- Process orientated method required
- Investigation of available techniques
  - non-proprietary
  - supported
  - track record
  - evaluation technique
- CMM and SCE selected for further investigation

European SEPG '97 - 10

DERA

UK Trial of SCE Method

- Aim
  - to establish applicability within UK
  - 3 volunteering UK Defence contractors
  - feedback solicited
- Successful outcome
  - required live application

European SEPG '97 - 11

DERA

Pilot SCE

- Major UK procurement
- Three consortia bidding
- Three software subcontractors visited
- SEI Involvement
- Team of 6
- Five weeks of effort

European SEPG '97 - 12

DERA

Lessons Learned

- Data collection successful
- Company cooperation good
- Team composition significant
- Management of expectations important
- Need for UK Training

European SEPG '97 - 13

DERA

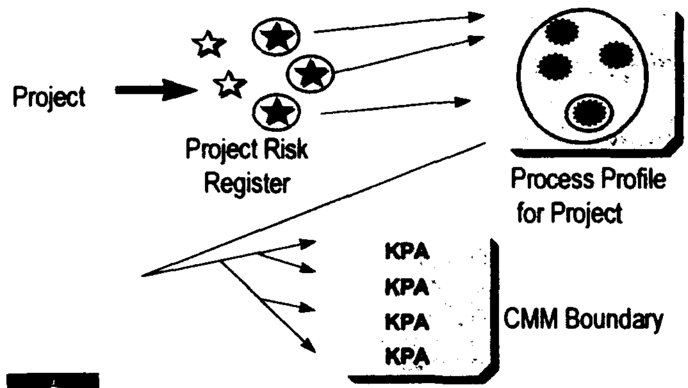
Enhancements

- Not used routinely on all projects
  - risk primary decision driver
- Reduce disruption on bidding companies
  - short-listed contractors only
- More context specific
  - context domain experience
  - project specific risks form input

European SEPG '97 - 14

DERA

Risk focus



European SEPG '97 - 15

DERA

Re-use of Results

- Re-use of previous SCE encouraged
  - previous results
  - elapsed time
  - similar product attributes/requirements
  - boundaries of SEPG organisation
- *But only*
  - with bidding company's consent

European SEPG '97 - 16

DERA

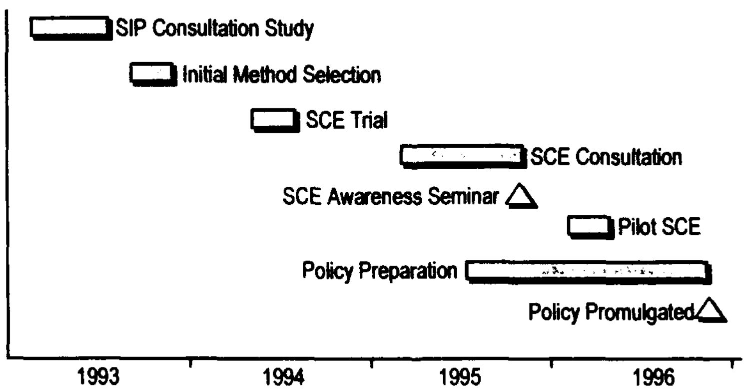
Consultation

- Aim
  - to ensure smooth introduction of SCE
- Internal discussions
- Industry
  - UK Trades Associations, US contractors and DoD
- Capture and action concerns

European SEPG '97 - 17

DERA

Consultation with Industry



European SEPG '97 - 18

DERA

Benefits

European SEPG '97 - 19

DERA

Benefits to MoD

- Addresses original concern
  - *forms an input to contractor selection process*
- Well-defined method for identifying and managing software process risks
- Method provides in-depth, reliable, repeatable information with audit trail
- Consistent with MoD's established use of Pre-Contract Award Evaluations (PCAE)

European SEPG '97 - 20

DERA

Benefits to Industry

- Incentive towards Internal Process Improvement
- IPI model not mandated
- Recognition of business needs
- Quantitative understanding of process

European SEPG '97 - 21

DERA

Implementation

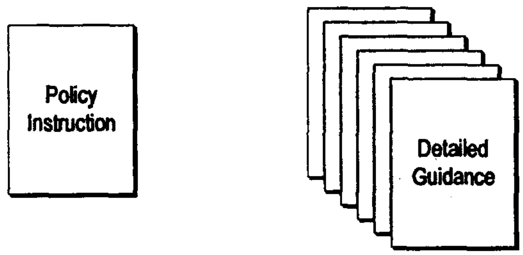
European SEPG '97 - 22

DERA

Policy Promulgation

Chief of Defence Procurement Instructions TECH/490

Defence Procurement Management Guide TECH/490



European SEPG '97 - 23

DERA

Guidance material

- CMM & SCE overview
- Selection criteria
- When to use
- Planning
- Tailoring
- ITT preparation
- Team selection
- Training
- Briefing of bidders
- Performing evaluation
- Use of results
- Learning from experience
- Documentation & training

European SEPG '97 - 24

DERA

DERA focus

- Provision of:
  - Advice to MoD project managers
  - Qualified Evaluators
  - Team Leadership
  - SCE and CMM Training
  - Expertise in process assessment and supplier capability determination
  - *Consistency in evaluation*

European SEPG '97 - 25

DERA

MoD focus

- Point of contact between DERA and MoD(PE)
- Infrastructure
  - lessons learned
  - feedback
  - continuity
- Maintain SEI liaison

European SEPG '97 - 26

DERA

Summary

- Trials and consultation
- SCE now selected and enhanced
- Significant benefits anticipated
- MoD(PE) and DERA working closely
- Arrangements in place for implementation

European SEPG '97 - 27

DERA

A Co-ordinated Approach to Identifying Software Development Risk in MOD Projects

The End !!!

European SEPG '97 - 28

DERA

THOMSON-CSF

TTM /SOFTWARE AND SYSTEMS DEPARTMENT

Five years experience in SPI: lessons learned

European SEPG'97

Amsterdam - juin 1997

TTM /SOFTWARE AND SYSTEMS DEPARTMENT

Agenda

- The Thomson-CSF Context
- The Thomson-CSF maturity profile
- SPI at corporate level
- Experience and assets sharing
- Improvement results

THOMSON-CSF TTM /SOFTWARE AND SYSTEMS DEPARTMENT

The Thomson Group

Thomson-SA

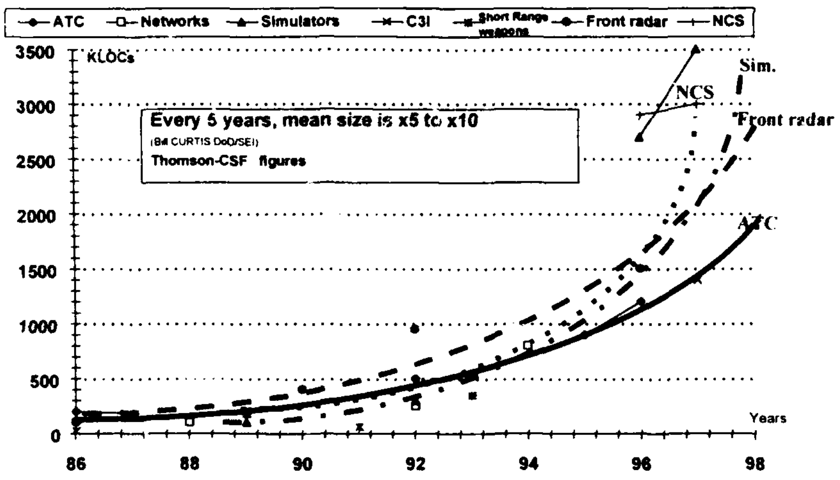
- **Thomson-CSF**
  - Consolidated revenues (1995): US $ 7.2 billion
  - Employees (at 31 Dec. 1995): 46,300
- **Thomson multimedia**
  - Consolidated revenues (1995): US $ 7.4 billion
  - Employees (at 31 dec. 1995): 49,500

<u>SOFTWARE</u> is one of the main (and increasing) added values in our systems (between 13% and 90% of the total of our principal projects).

More than 5000 software engineers.

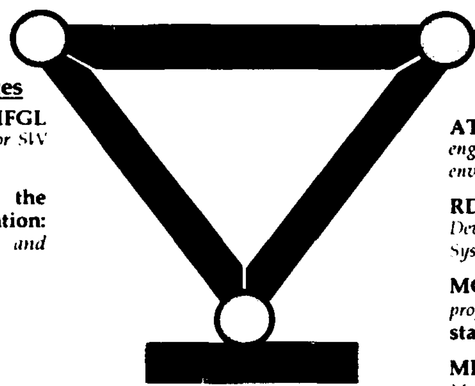
THOMSON-CSF TTM /SOFTWARE AND SYSTEMS DEPARTMENT

Software Intensive System trends



THOMSON-CSF TTM /SOFTWARE AND SYSTEMS DEPARTMENT

The Thomson-CSF corporate actions



Human resources

Training: IFGL *(Training Institute for SW engineering)*: **1987**

Management of the software population: *disciplines and functions* **1993**

Methodology and Tools

ATGL *(THOMSON SW engineering development environment)*: **1991**

RDL *(Software Development Reference System)*: **1990**

MCPA *(Method for managing proposals and programs)*: **stabilized in 1993**

MIST*(System engineering Method)*:**1993**

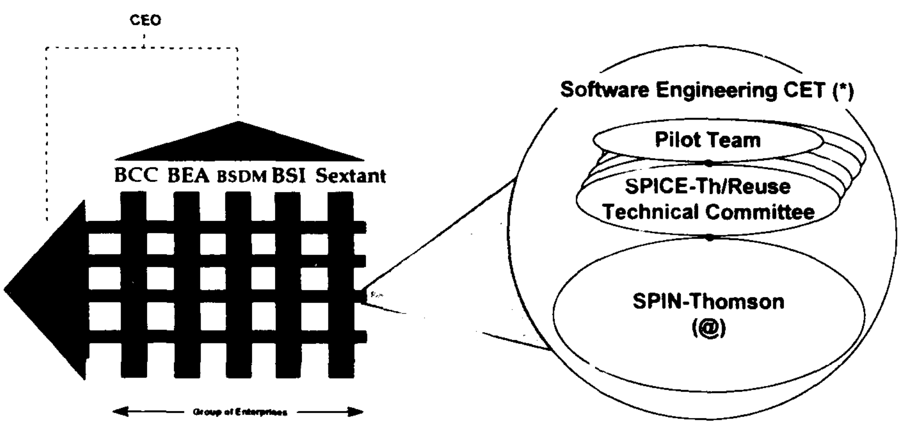
Software Development Process

SPICE-Th (*): 1992

(*) Different from ISO-SPICE !

THOMSON-CSF TTM /SOFTWARE AND SYSTEMS DEPARTMENT

The Thomson-CSF organization for SW

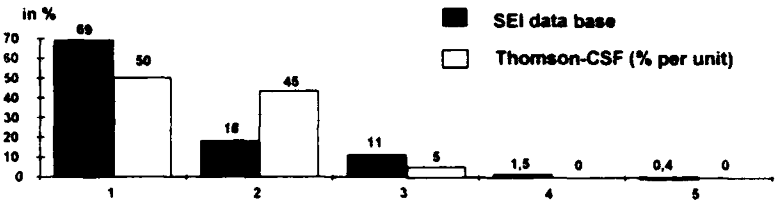


(*) Common Efficiency Team
(@) SEPGs at ENTERPRISE or Business Unit level

THOMSON-CSF TTM /SOFTWARE AND SYSTEMS DEPARTMENT

The Thomson-CSF maturity profile

Maturity profiles repartition (December 96)



Mean time to reach a level (in months)

	SEI (Avr 96)	Thomson-CSF (Dec. 96): between assessments	Thomson-CSF (Dec. 96): Strategic plan to 2nd assess.
Level 1 → 2	27	35 (28 → 48)	29
Level 2 → 3	25	17 *	17 *

* Estimate and actual

THOMSON-CSF TTM /SOFTWARE AND SYSTEMS DEPARTMENT

Difficulties for level 2

- **Most of the time**, formalization of the estimation practices (costs, schedule and sizing parameters...at the domain level);
- **Remaining cases** with weaknesses on System Requirements Allocated to SW,

  commitment on a concurrent definition...;
- **For some Units**, responsibilization of the SW Project Manager (PM) & a synthetic commitment;
- **A trend** where too much delegation on work products audit by SQA.

- A corporate guideline that defines the **process** and **methods**,
  + awareness of the **best examples**;
- Focus on the System Eng. **process** or simple formalization of the **RM process**...

  + a simple **commitment form** between PM & SW PM;
- A focus on involvement of the SW PM in Syst. & SW spec. (& the benefits) + the **commitment form**;
- Focus on the task of **tracking** the raised **action items** .

THOMSON-CSF TTM /SOFTWARE AND SYSTEMS DEPARTMENT

Difficulties for level 3

- Generalization of **Peer Reviews**,
  - ✧ tailoring when Req. unstability,
  - ✧ former practices on document reviews;
- Keep the **data-base** simple;
- **Tailoring**,
  - ✧ which approach,
  - ✧ difficulty to think "risks" and "efficiency"...!
  - ✧ small projects.
- A lot of **training sessions** & some **benchmarks**,
  - ✧ **core** specifications and design,
  - ✧ several types (**high** & **low**...);
- concrete assessed **example**;
- A continuous focus with,
  - ✧ a current **working group**,
  - ✧ the company assets **catalog**,
  - ✧ ...

SPI at corporate level: *SPICE-Th II*

93-94 Process Action Teams (PAT)

SW Indicators	Unit 1 in charge
SW planning, tracking and oversight	Unit 2 in charge
SW Quality Assurance	Unit 3 in charge
Requirements Management	Unit 4 in charge
SW Configuration Management	Unit 5 in charge
SW Subcontract Management	Unit 6 in charge
Peer Reviews	Unit 7 in charge
SW Reuse	Unit 8 in charge
SW Risks Management	Unit 9 in charge
SW Estimation	Unit 10 in charge

After # 10 months for PAT, 3 months for designing a corporate training module for each

SPI at corporate level: training by Campus-Th

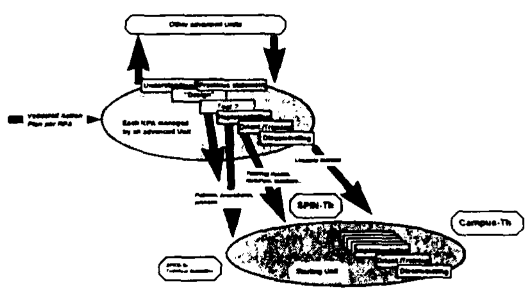
- Presently 14 courses (# one day, across both level 2 &3),
  - ✧ Understanding the level (2 or 3),
  - ✧ Conducting an SPI,
  - ✧ Requirement Management & Engineering,
  - ✧ Advanced Planning & Tracking, Managing Risks,
  - ✧ SW Estimation & Capitalization, Capitalization & SPI,
  - ✧ SW Subcontract Management,
  - ✧ SCM process,
  - ✧ SW products/systems engineering, SW tests & verification,
  - ✧ Peer Reviews,
  - ✧ Teamworking.

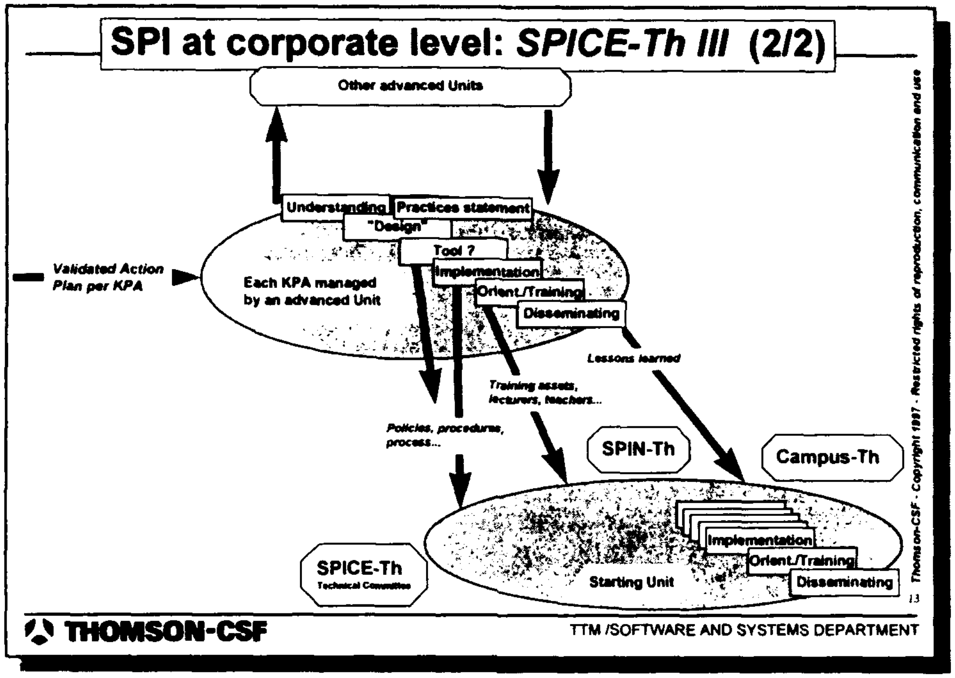
700 students (1996)

- SW Project Management, SQA (Courses with mentoring). **300 students (1996)**

SPI at corporate level: *SPICE-Th III* (1/2)

Goals : **- minimize guides writing/rewriting costs**
- speed up the dissemination process
- shorten the time to reach level 3
- insure that guidelines are closer to the field




SPI at corporate level: *SPICE-Th III* (2/2)
Other advanced Units
Understanding
Practices statement
"Design"
Tool ?
Implementation
Orient./Training
Disseminating
Validated Action Plan per KPA
Each KPA managed by an advanced Unit
Lessons learned
Training assets, lecturers, teachers...
Policies, procedures, process...
SPIN-Th
Campus-Th
SPICE-Th
Technical Committee
Implementation
Orient./Training
Disseminating
Starting Unit
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13
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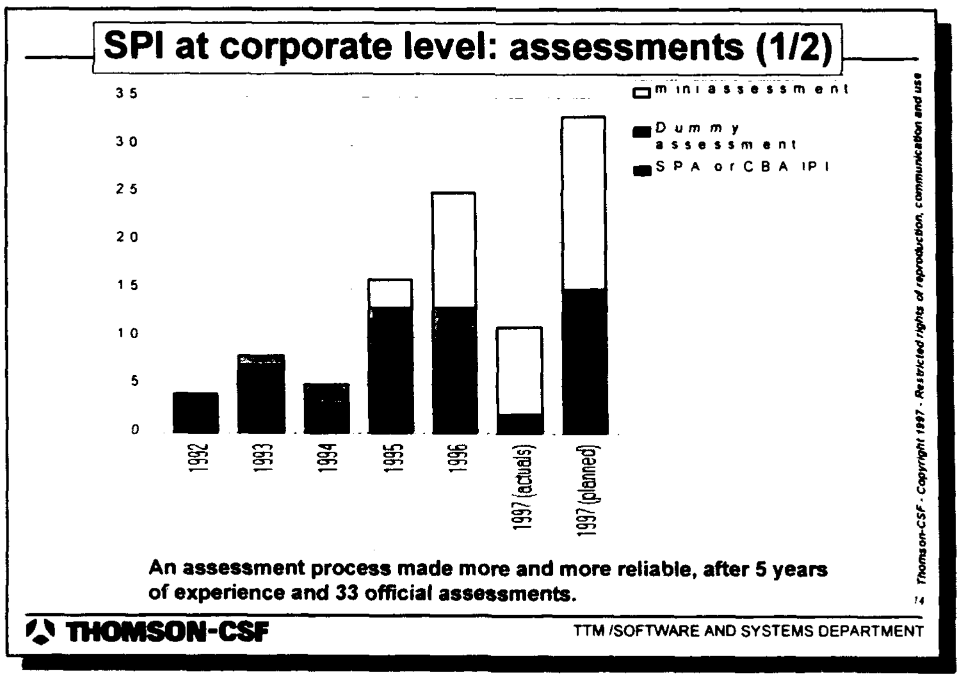
SPI at corporate level: assessments (1/2)
35
30
25
20
15
10
5
0
mini assessment
Dummy assessment
SPA or CBA IPI
1992
1993
1994
1995
1996
1997 (actuals)
1997 (planned)
An assessment process made more and more reliable, after 5 years of experience and 33 official assessments.
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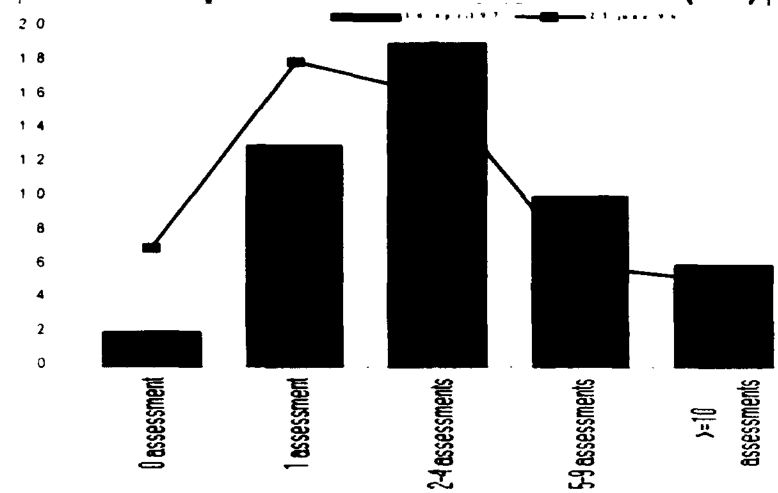
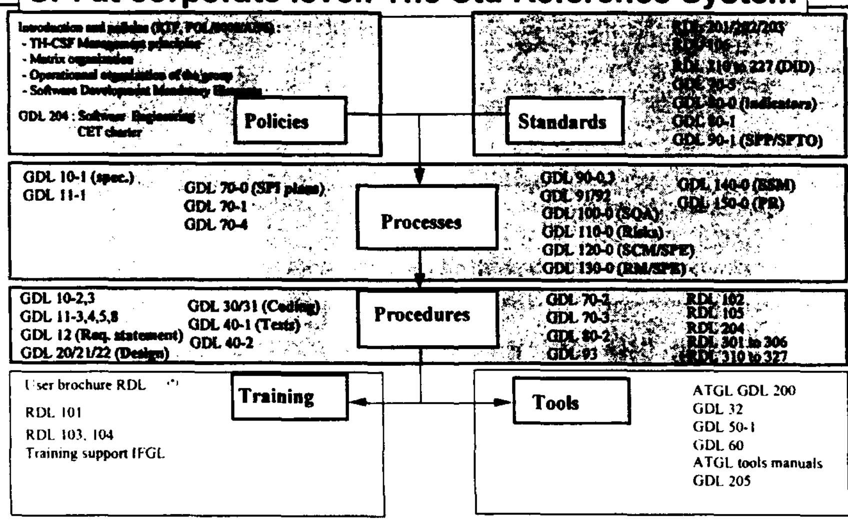
SPI at corporate level: assessments (2/2)



An assessment process based on a pool of 50 experienced team members, with 2 Thomson-CSF and 2 US SEI authorized "lead assessors".

SPI at corporate level: The Std Reference System



(*) *As such the user brochure is not a guide, however it is located under "training" because of its educational quality*

Experience and assets sharing

- SPIN-Th meets every month, the topics are planned for several months, based on:
  - ✧ the needs of SEPGs (regular survey by the chairman),
  - ✧ the assets catalog,
  - ✧ the recent reach of a level by a Unit;
- The assets catalog is filled at the end of each assessment, by the members of the team; there are other opportunities;
- The Standard Reference System and the assets catalog are electronically available on an internal server.

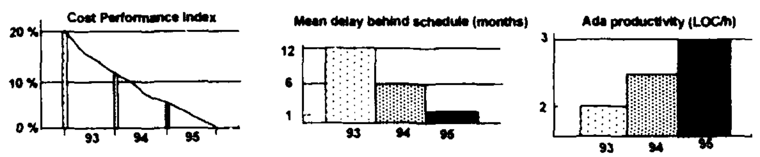
Getting to level 2 benefits (1/2)

- (Program/Project Managers and Senior Managers) "we have a better visibility of what's going on in the SW project",
  - ✧ ...Project Managers analyse the indicators...,
- Easier commitment with the customer for major changes in the contract,
  - ✧ file of rationales...,
- (SW Project Managers) "we feel completely responsible of the SW part",
- "better stabilization of the baselines";

Getting to level 2 benefits (2/2)

- A mean improvement of 17 % of Cost Performance Index in 2 years, while reaching level 2 (measured on 3 Units; # 800 Sw eng.);
- Several Units where the Schedule Performance Index,
  - ✧ improve from 60 % to 5 %,
  - ✧ and concurrently, for example:

A level 2 Business Unit



• + a project with no defect at acceptance

19

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Getting to level 3 benefits (1/2)

- Getting to level 3:
  - ✧ in one domain (2 major projects with # 100 persons each),
    - ▫ no over costs,
    - ▫ in time acceptance (with no defects found),
    - ▫ high customer satisfaction,
    - ▫ rapid staffing examples,
      - + 180 persons within 2 years, including
      - + 100 persons within 10 months;
  - ✧ willingness not only of the SW managers (larger buy-in among the SW developers).

20

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Getting to level 3 benefits (2/2)

- **PR benefits**: for a level 3 Unit, cost of defect detection and correction 4 time less if done before any tests, with
  - ✧ an efficiency of 50 % and,
  - ✧ a benefit of 12 % on SW development costs (when 80 % PR on code);
- **ROI, getting to level 2**: this Unit has worked out a ROI of 3.6 to 1.

digital

From Chaos to Control

A Case Study of Software Process Improvement at Digital

Debbie Hellmann/Alf Pilgrim
Digital Equipment Corporation
June 1997

debbie.hellmann@x400.reo.dec.com

digital

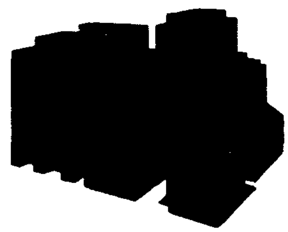
Topics

- Background
- Results
- Assessment Strategy
- Learnings and Experiences
- Next Steps
- Questions

The Company

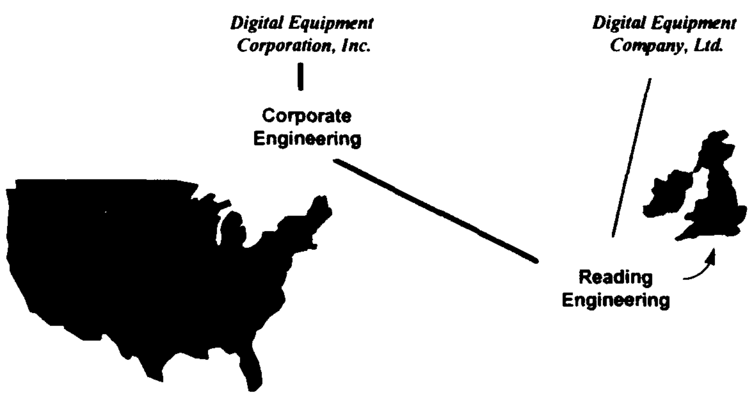
Digital Equipment Corporation

- Digital is a world-wide supplier of computer **solutions**...hardware, software, networks, and services
- Corporate headquarters in Maynard, Massachusetts
- 66K employees world-wide



http://www.digital.com

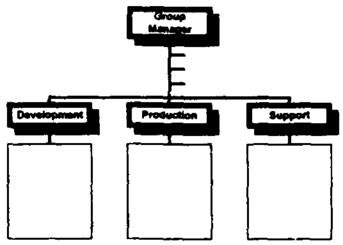
The Site



The Organisation

Integrated Office Services Group

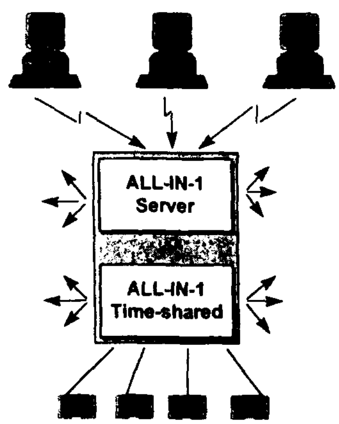
- ~ 60 engineering staff
- Part of a 3-site (110-person) organisation in England, the US, and Ireland
- Responsible for groupware products
- Experienced in large scale integration projects



The Major Product

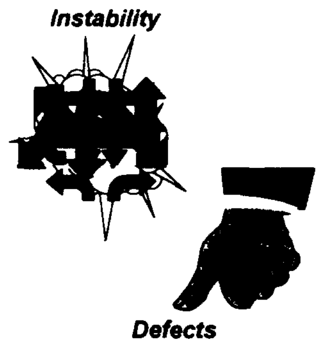
ALL-IN-1

- Multi-function integrated office system
- Size:
  - >10K modules
  - >2.5M high-level LOC
  - 2-3K changes per release
- Installed base of 5 million users
- Evolved from timeshared to **client-server**



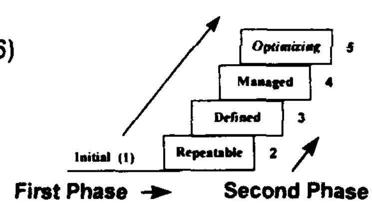
Problems

- Major software release has significant problems
- Software builds out of control
- Classic chaotic organisation
- Need for improvement seen by management staff and engineers



The Improvement Effort

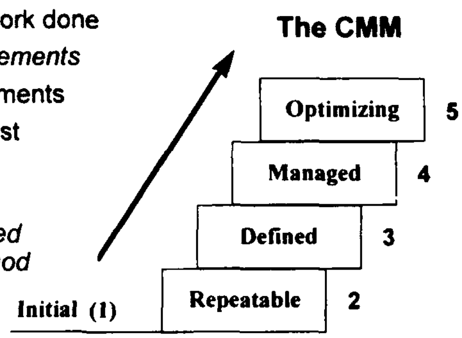
- First Phase (1988-1992)
  - not oriented around any particular methodology
- Second Phase (1992-1996)
  - guided by Capability Maturity Model (CMM) and self-assessment process
- Significant corporate restructuring and downsizing during this period



digital Why the CMM?

- Consistent with work done
- Addressed *requirements*
- Guide to improvements
- Benchmark against industry

... *And the associated assessment method*



digital Topics

- Background
- Results
- Assessment Strategy
- Learnings and Experiences
- Next Steps
- Questions

SEI CMM Assessment Results

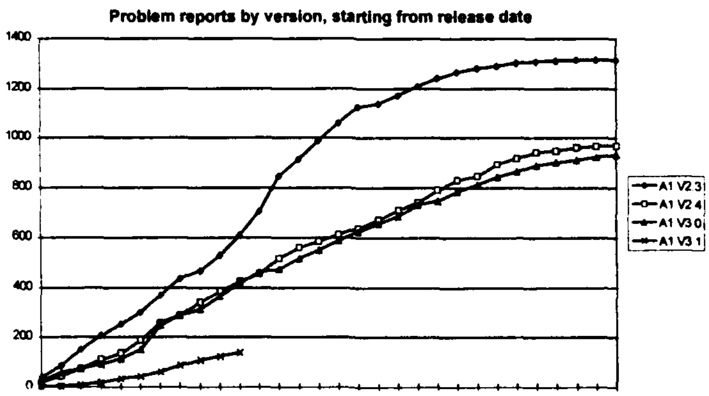
1993 Assessment

- At Initial level with some projects running at the Repeatable level. Some processes in place for Defined level.

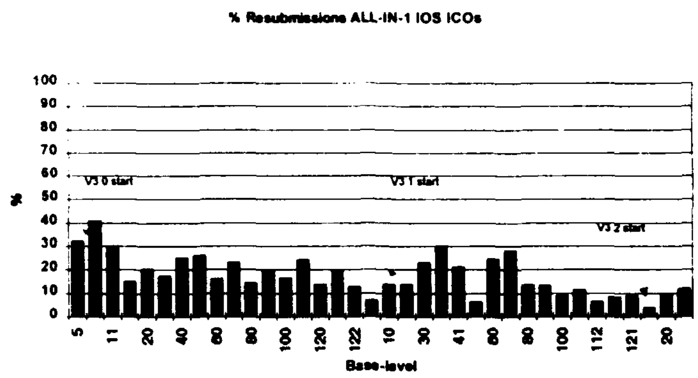
1996 Assessment

- At Defined level.

Defects Found after Release



Code Resubmissions

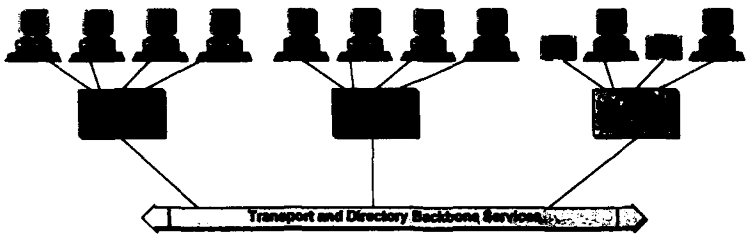


Comparing Projects

- **Diamond**
  - 24 month project
  - 50 engineers
  - 22 failures
  - 484 resubmissions
  - 20% rework
  - 2931 days of rework
- **Sapphire**
  - 18 month project
  - 17 engineers
  - 2 failures
  - 93 resubmissions
  - 13% rework
  - 565 days of rework

Developers on ALL-IN-1

Single to Multi-Product Responsibilities



- Increased span of product responsibilities
- Bandwidth to exploit new opportunities
- Increased capacity for survival

Topics

- Background
- Results
- Assessment Strategy
- Learnings and Experiences
- Next Steps
- Questions

Assessment Strategy

- Targeted high-visibility projects only
- Cross-functional assessment team
- Two distinct functional group types
  - development engineers
  - others
- Aimed for 100% participation
- Expectation of 24 month cycle

Assessment Experiences

- Hard work!
- Requires investment...management support
- Expectations must be set realistically
- Training essential for everybody
- Some interpretation and tailoring required
- New assessment technique is better

Post-Assessment Experiences

- Commitment requires constant reinforcement
- Effective change management is critical
- Must treat improvement as a *bona-fide* project(s)
- Dealing with organisations at the Initial level can be frustrating
- Need to manage the management line
- Results have wholly justified investment

Most "bang for the buck"

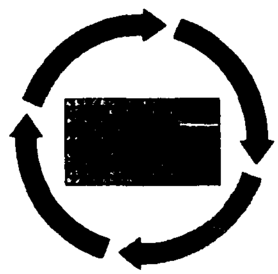
- Formal configuration management
- Regular cross-project reviews
- Better integration of quality assurance
- Formal reviews
- Statistics publication
- Document and process templates
- Base-level planning

Topics

- Background
- Results
- Assessment Strategy
- Learnings and Experiences
- Next Steps
- Questions

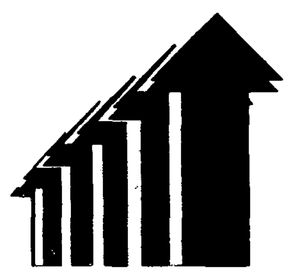
Next Steps

- Implement actions from '96 assessment
- More extensive use of metrics for continuous improvement
- ISO 9001 / TickIT registration
- Assist partner groups



Summary

- Improved customer confidence
- Improved productivity
- Greater predictability
- Improved communications
- Higher group morale
- Catalyst for change



Performance

digital

A Case Study of CMM Software Process Improvement at Digital

Questions ???

The complementary aspects of process capability and reuse capability

Sergio Bandinelli

Sergio.Bandinelli@esi.es

European SEPG

June 19, 1997

E-SEPG'97 — 1

Overview

- Product-line engineering
- ROADS project
- ROADS preliminary results
- ROADS lessons learned
- Reuse and process capability
- R-SPICE and SPLICE models

E-SEPG'97 — 2

Product-line engineering

- A product-line is a collection of (existing and potential) products that addresses a coherent business area or domain.
- Product-line engineering is concerned with the efficient development of a product-line that delivers high quality products tailored to the specific needs of each customer.

E-SEPG'97 — 3

Transtioning to product-line engineering

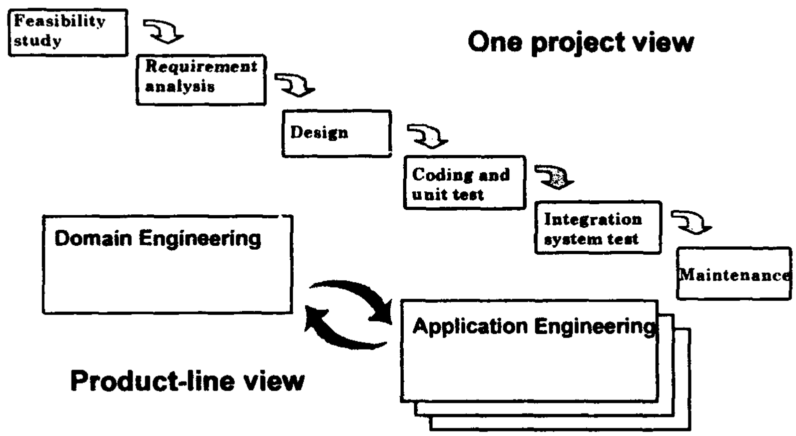
One of-a-kind

Many of-a-kind
•family view
•assembly-line style

- Changes required
  - to the development process
  - to the organisation
- Management commitment is essential

E-SEPG'97 — 4

Changes in the process



E-SEPG 97 — 5

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Changes in the organisation: conflicting forces

Deliver products	Update practices
Keep projects going	Improve processes
Short-term profit	Long-term benefit

E-SEPG'97 — 6

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The experience of ROADS

- ROADS: Reuse Oriented Approach for Domain based Software
- Partners:
  - Thomson-CSF
  - European Software Institute (ESI)
  - Prosperity Heights Software (PHS)
- PIE (Process Improvement Experience) under the ESSI programme.

E-SEPG'97 — 7

Four pilot experiments

- Air traffic control
  - decrease time-to-market to 1/3 of current.
- Control and command of short range air defence systems.
  - improve the reliability
- Training simulators
  - Obtain significant reduction of costs
- Traffic Management (planning of traffic)
  - Improve the flexibility and robustness

E-SEPG'97 — 8

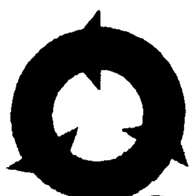
Project baseline

- Diagnosis of current situation
  - to evaluate potential profitabiliy
  - to understand existing strengths and weaknesses in the organisation
  - to set the appropriate priorities
- Issues considered:
  - domain potential
  - organisation's reuse capability

E-SEPG'97 — 9

Incremental approach

- Each increment involves performing domain engineering activities that bring support to projects
- Typical increment time: 3 months



E-SEPG'97 — 10

Assessment experience

- Reuse capability assessment using RCM.
- Domain potential assessment using DAM
- Assessment characteristics
  - Self-assessments (3 to 8 persons in assessment team, incl. facilitator)
  - One day duration
  - Results presented in the form of profiles and assessment findings

E-SEPG'97 — 11

Assessment results

- Adaptation introduced to RCM and DAM
  - Duration reduced
  - Translation to French
  - Graphical representation of profiles changed.
  - Modification of rating scale
- Participation of key business development experts turned out to be essential in the successful development of assessments

E-SEPG'97 — 12

Preliminary improvement results

- Identification of new opportunities for improvement.
- Creation of awareness in the organisation of the range of applications it is capable of building by capitalising of past project experience.
- Initial support to projects: e.g., additional support for negotiating and setting new contracts or to support decision on whether to bid for a contract or not.

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Lessons learned

- Reuse adoption requires some level of process maturity.
- Established processes are much difficult to change.
- Difficulties and resistance encountered when the reuse adoption programme follows other quality improvement actions (such as obtaining ISO 9000, achieving a certain CMM level, etc.).

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Reuse and process capability

- Process capability: is the ability of a process to achieve a required goal.
- Product-line capability: is the ability of an organisation to deliver products that satisfy specific customer needs, using a common domain-specific support of tailorable processes and assets.
- Domain reuse potential: is a measure of the potential of profitability from applying reuse in a domain (intended as a business area).

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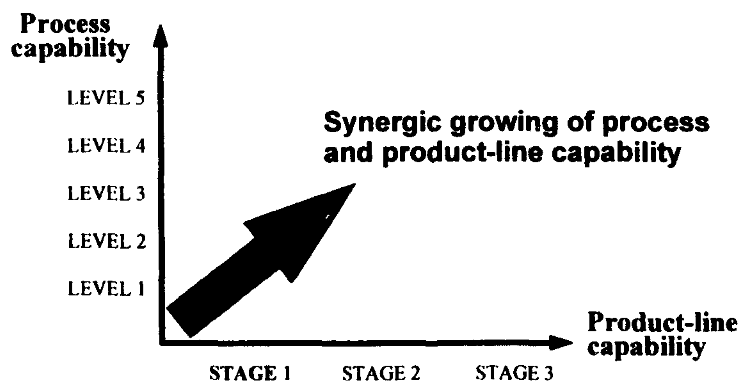
Synergy between reuse capability and process capability



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Assessment models

- R-SPICE: an extended SPICE process capability model enriched with a new product-line process category.
- SPLICE (Staged Product-LIne Capability Evaluation): a staged model for transitioning to product-line engineering.
- DAM: a domain assessment model.

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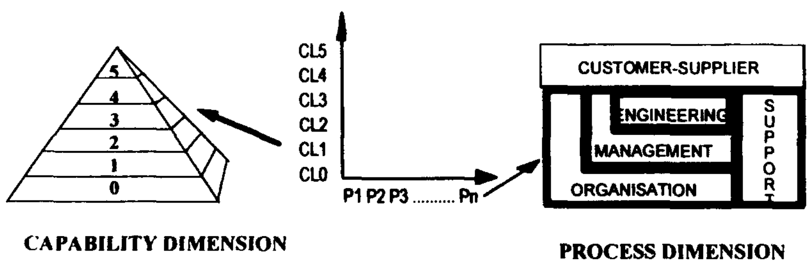
The SPICE Reference Model



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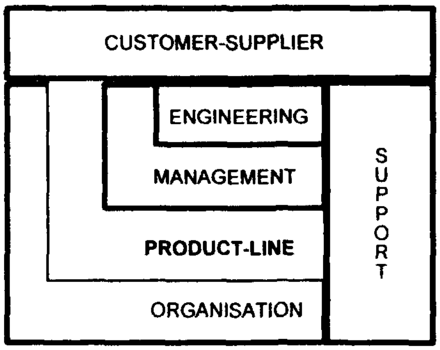
R-SPICE process dimension



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Preliminary set of LIN processes in R-SPICE

- LIN.1 Manage the product-line
- LIN.2 Define the product-line
- LIN.3 Engineer the product-line
- LIN.4 Define product-line production process
- LIN.5 Provide project support

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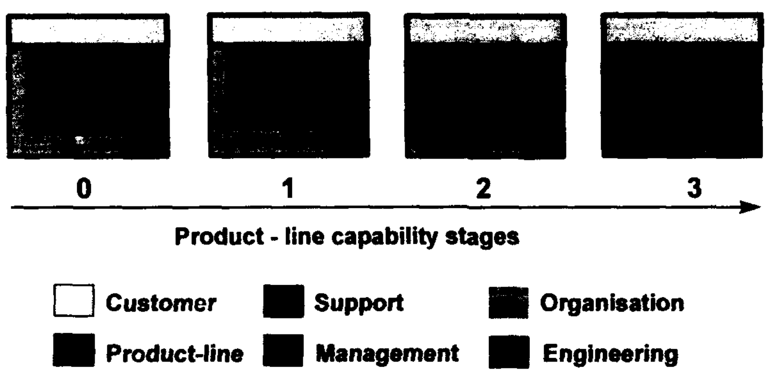
The SPLICE model

- The SPLICE model identifies a set of stages in the transition to product-line engineering.
- Each SPLICE stage
  - corresponds to one coherent set of goals and practices to achieve those goals
  - constitutes a step in the direction of product-line engineering.

E-SEPG'97 — 21

R-SPICE process dimension and product-line capability



E-SEPG'97 — 22

Conclusions and future work

- Preliminary results on experiences about transitioning to product-line engineering
- Capability models support this transition
- Next steps:
  - Build consensus
  - Further develop models and explore synergy
  - Validate, validate, validate...

E SEPG 97 – 23

Software Best Practice: Benefits for the Business

SEPG'97
Amsterdam 19/6/97

esprit

Mr. A. Moya
European Commission
DG III F

The European Commission - DG III. IT Programme. 1

esprit

Overview

- ✓ Software Best Practice: Why?
- ✓ A Few Case Studies
- ✓ Conclusion

The European Commission - DG III. IT Programme. 2

A Strategic Challenge for Europe

Software Best Practice

Making use of the best practices in management and software engineering methods and technology

The European Commission - DG III. IT Programme. esprit 3

Quality and Community Policies

- **Industrial Policy**

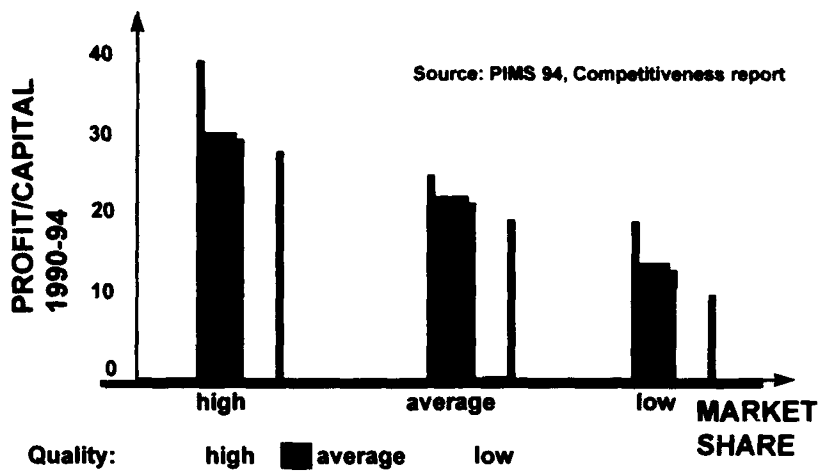
  Industrial Competitiveness

- **Internal Market**

  Free movement of goods and services (in particular)

The European Commission - DG III. IT Programme. esprit 4

Quality, market share and profit



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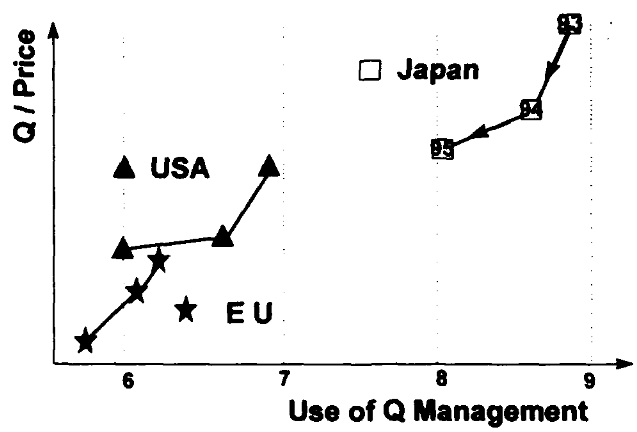
Quality and Competitiveness (i)

World Competitiveness Report



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Quality and Competitiveness (ii)

- **Quality: Critical in**

  gaining an increased competitive edge

- **A lot remains to be done**

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Actors in SBP

- **Economic operators**

  Main responsibility

- **European Union**

  Facilitator ➡ overall favorable economic environment

  AWARENESS POLICY

  SUPPORTING IMPROVEMENT

- **National Activities**

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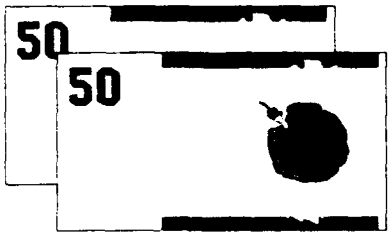
Best Practice. Critical?



CREDIT CARD

- 55,000 cards issued
- People queuing to get 100 Guilders for free

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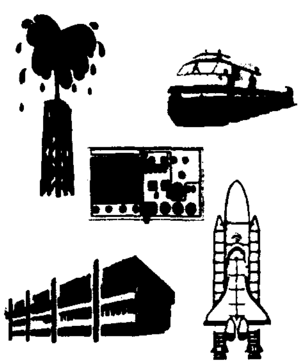
Your Best Practice



Different Business

Environments Require

Different Priorities

The European Commission - DG III. IT Programme.

Different Priorities

BUSINESS DRIVER

- Time to market

XIOSBANK	20% consumer credit
CLAAS	5 MECU sales boost

- Safety / Reliability

B&K	75% less error reports

The European Commission - DG III. IT Programme. 11

Case Studies

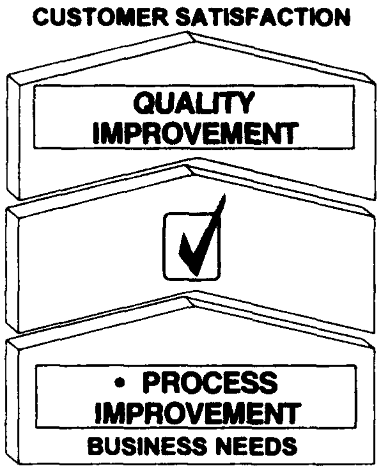
5 CASE STUDIES

SHOWING BUSINESS BENEFITS

FROM THE ESPRIT INITIATIVE ESSI

The European Commission - DG III. IT Programme. 12

Quality vs Process



Case studies show correlation

B&K 75% error reduction

Surveys show correlation

IBM survey

HOWEVER,
this is a statistical truth
unless ....

DRIVEN BY BUSINESS NEEDS

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What is actually done ?

Is SBP a Big Issue for you?
Indeed !!

What do you actually do? Little ?

- **Any practical activities?**

process improvement, education,...?

e.g. 53% of Irish companies have no QMS (Forbait 1995)

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CONCLUSION

SBP: Esprit contributes

- **Esprit CALL FOR PROPOSALS <u>OPEN NOW</u> FOR:**
  - **Technology Transfer**
  - **ESSI**

For further information:

http://www.cordis.lu/esprit/src/sthome.htm

The European Commission - DG III. IT Programme. 15

Software Best Practice: Benefits for the Business

I. Purpose

The purpose of this paper is to show the **substantial and quantifiable business benefits** to be gained from adopting Software Best Practice.

This paper arose from a study of a number of Software Best Practice projects which have been carried out over the last two years in different types of organisations with a variety of different goals. This means that the information relates to **"real-life" case studies**.

Fom Business Needs to Customer Satisfaction: *Software Best Practice*

Making use of the best practices in management and software engineering methods and technologies.

II. The Business Messages

There are two key business messages, one for companies using software in their products or in their business support systems, "the clients", and one for "their providers" (either software companies or internal informatic departments). In other words, key messages for the vast majority of businesses in Europe.

The message for **"the providers"** is that Software Best Practice has proved that **productivity**, **quality, customer satisfaction**, and **speed of delivery** can be **significantly improved** through Software Best Practice.

The message for **"the clients"** is that the **software supplier's professionalism** will materially affect the **quality**, the **timeliness** and the **cost** of what is delivered. Clients should, in their own interest, monitor their suppliers and determine the level of professional software engineering employed.

This paper focuses on **case studies**. In every one of them a modest investment in adopting Software Best Practice principles to improve software engineering practices has produced significant business benefits. For example:

"The good news is clear business benefits"

Company	Result
BBV	6.5 times more efficient migration.
B & K	75% less errors in released products.
CDC	50% reduction in maintenance cost.
Claas	5 Million Ecu sales boost.
ENEL	18% cost reduction.
Engineering	60% improvement in accuracy.

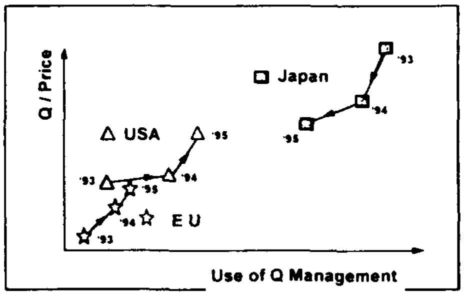
- at **BBV**, the largest Spanish bank, migration of applications programs to a new platform was 6.5 times more efficient;
- at **Brüel & Kjaer,** a Danish manufacturer of high precision instruments, systematic unit testing reduced the number of errors in products released to the market by 75%;
- at **CDC**, a major French public finance company, software maintenance cost is being reduced by 50%;
- at **Claas**, Europe's largest manufacturer of harvest machinery, better specification and software management brought a significant product enhancement to market a year early, boosting sales by at least 5 Million ECU;
- at **ENEL**, the world's second largest electricity supplier, a formal specification method reduced project development cost by 18%;

- at **Engineering**, a software company, a professional approach to estimating project costs, effort, duration, etc. improved the accuracy of their estimating by 60%.

In each case, not only have the efficiency and quality of software production and maintenance improved: the real good news is that there have been **clear business benefits**. In seven of the cases the competitiveness of the company as a whole has been materially uplifted. In five cases, close attention to the specification and communication of requirements has enriched customer satisfaction and customer-supplier relationships. In four cases, the company's quality image has improved. In another two, the high profile success achieved through improved software engineering has substantially developed senior management's appreciation of what Information Technology can do for its business.

Recent studies performed by a number of well known organisations confirm the business benefits gained through Software Best Practice. Among others, it is worth mentioning an IBM(1) survey of 363 European companies from different sectors, reports published by the ESI(2) (European Software Institute) and the paper published by Ovum(3) based on experience drawn from the European Software and Systems Initiative (ESSI).

Note should be taken of the general trend observed in the World Competitiveness Report (sketched in Fig 1) concerning the use of Quality Management. The USA are progressing. Europe is progressing but at a slower rate and a regression is observed in Japan. Europe still has much business benefit to gain.



This paper identifies the potential benefits in the field of software best practice. Neither the software engineering approaches it describes nor the nature of the benefits achieved are peculiar to the individual companies discussed. Their experience indicates that, by intelligent use of the large repertoire of management methods and software tools available, **any** software development operation (whether in a software company or in-house in a user) can make significant improvements in what it delivers, in how soon it delivers it, in its cost of delivery, and above all, in its customers' satisfaction. To achieve this requires leadership and professionalism. **No software developing company can afford to ignore this finding.**

(1) (2), (3) References can be found in the annexes.

III. CASE STUDIES

A. Summary

CASE STUDY 1 **SPECIFICATION AND SOFTWARE MANAGEMENT RETHOUGHT**

"5 Million Ecu Boost to sales"

Claas KGaA and their software supplier, Müller-Elektronik, radically revised their processes for drawing up and communicating requirement specifications and for implementation management. Claas's product came to market a year earlier as a result, well before any direct competition, and is likely to bring in 5 MECU + of sales in that year. Management understanding of the business contribution of electronics has leapt forward.

CASE STUDY 2 **EFFICIENT MIGRATION OF APPLICATIONS**

"Sixfold Productivity Gain"

PROFit Gestión Informática S.A. offers a service for converting software from one environment to another. By using software engineering techniques to analyse the suitability of application for conversion - recommending redevelopment of the application where it was not suitable - and to semi-automate the conversion process, they were able to improve their productivity from one programme converted per week to 6.5, and also to improve post-conversion maintenance productivity by at least 10%.

CASE STUDY 3 **INTRODUCTION OF CONFIGURATION MANAGEMENT**

"Gaining a Competitive Edge"

By introducing configuration management into the development process of their financial application products, Datamat Ingegneria dei Sistemi S.p.A. vastly decreased the time-to-market and the number of errors in their software products. The overall effect was to decrease development costs in order for Datamat to gain a competitive edge.

CASE STUDY 4 FORMAL SPECIFICATION METHOD

"Up to 18% Cost Reduction"

After introducing a formal specification method into their software development process, ENEL has experimented a reduction of the overall development effort (18%) and an increment of the company outsourced control system.

CASE STUDY 5 IMPROVED PROJECT ESTIMATION

"60% reduction in average project estimation errors"

Engineering Ingegneria Informatica S.p.A. succeeded in improving the accuracy of their project estimation (manpower, cost and elapsed time) through improving their software engineering. This was achieved by building a database compiling their experience gained in earlier projects. The result was to reduce the average estimation error from 25% to 8%.

CASE STUDY 6 A FRESH START WITH NEW IT TECHNOLOGIES

"10% in Overall Company Costs Savings"

By using innovative software engineering techniques and taking advantage of the new IT and Communication technologies, RACE ASISTENCIA has been able to build a brand new integrated service system to support their mother company's core business. While cutting the Software Development costs by 20%, the new system also reduces by 10% the cost of the company main business operations.

CASE STUDY 7 TACKLING QUALITY MANAGEMENT

"Drastic Reduction in Maintenance Cost"

By adopting new tools for Quality measurement of software projects and Quality improvement of existing applications, Informatique CDC has achieved an important reduction in maintenance costs (up to 50% cost decrease) and gain in productivity (5-10%) and has increased the motivation of the software development work force.

CASE STUDY 8 ESTABLISHING WHEN THE BUGS OCCUR

"Reducing Bugs in Released Systems by 75%"

By introducing systematic unit testing procedures to verify the software (some 80% of the added value in their products), Brüel & Kjær was able to reduce the number of error reports by 75% in the new version of an electronic measurement product.

CASE STUDY 9 **TACKLING THE DOCUMENTATION HEADACHE**

"10-20% Performed Improvement as a Consequence"

By implementing a rational documentation system, accordingly to company' needs, VBI has achieved 10% schedule reduction and 18% budget savings. VBI has shown that small projects can be documented without adding overheads.

CASE STUDY 10 **QUALITY CONTROL SYSTEMS CHANGE THE WAY SOFTWARE IS DEVELOPED**

"Achieving ISO-9000 certification"

Due to customer demand the company has made software quality an integral part of the development lifecycle and significantly changed the way in which customer releases are approved.

CASE STUDY 11 **OBJECT ORIENTED DESIGN REDUCED TESTING TIME**

"Changing the software development process"

After adopting an object oriented design methodology, the company have reduced the amount of time required for testing and provided greater opportunities for code re-use.

CASE STUDY 12 **EXPERIMENTING CHANGES THE DEVELOPMENT PROCESS**

"40% Schedule & Effort reduction"

After experimenting with object-oriented technology the Regional Government Services group with TT Tieto Oy have implemented a working system to ensure take-up of new technologies through the rest of the group.

CASE STUDY 13 **ADOPTION OF KNOWLEDGE MODELLING METHODOLOGY**

"Using a methodology to gain ISO9001, wins new business"

By adopting a methodology to record knowledge elicited for the development of knowledge based software systems, the artificial intelligence section of Rolls-Royce and Associates have been able to achieve ISO9001 certification in an area without established methodologies. This has won them new contracts with their major customer.

Annexes

A. References

(1) Ensuring profitable investment in software process improvement. IBM. 1996.

(2) Software Engineering Practices in Europe 1995

(3) Best Practice in software development. Ovum. 1996.

B. Useful organisations

In examining your software processes you may find the following organisations of use. many organise conferences, seminars and workshops on a variety of related topics.

ESSI: Software Best Practice
The ESSI office
European Commission
DGIII F4 (N105 3/43), rue de la Loi 200, B-1049 Brussels
e-mail: essi@dg3.cec.be
fax: +32 2 296 83 64

European Software Institute, Spain
http://www.esi.es

Software Engineering Institute (SEI), Carnegie Mellon University, US
http://www.sei.cmu.edu

Software Process Improvement Networks
http://www.sei.cmu.edu/spins.html

Bootstrap Institute
Pasi Kuvaja +358 852 05 399
http://www.iol.ie/~iscn/homepages/bootstrap/index.html

SPICE
http://www-sqi.cit.gu.edu.au/spice
http://www.compita.co.uk

European Software Process Improvement Foundation
http://www.espi.co.uk
+44 (0) 1908 630500

National Computer Societies
British Computer Society (BCS) Software Process Improvement Network (UK)
Brian Chatters b.w.chatters@man0523.wins.icl.co.uk
+44 (0) 161 230 5718

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- Datamat	Mr G. Del Duca
- Brüel & Kjaer	Mr O. Vinter
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- Informatique CDC	Mrs. E. Crespin
- VBI	Mr. Moller
- LMS International	Mr. T. Vanmunster
- TT Tieto Oy	Mr. K. Malinen
	Mr. J. Pakkanen
- Rolls-Royce	Mr. C. Cadas
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